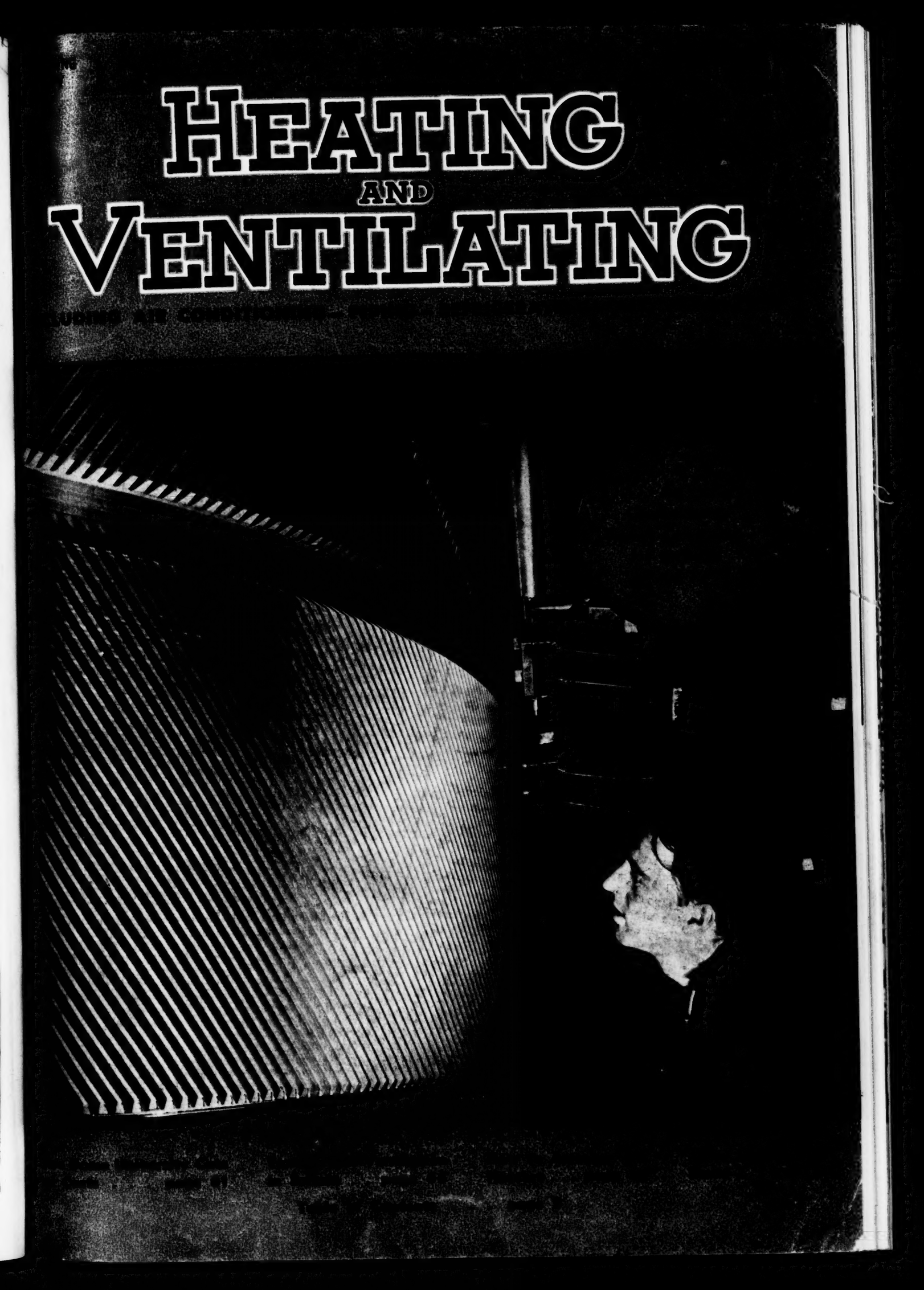
HEATING AND VENTILATING



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A MONTHLY MAGAZINE FOR ENGINEERS AND CONTRACTORS CONCERNED WITH THE DESIGN AND APPLICATION OF AIR CONDITIONING, REFRIGERATION, PIPING, AIR SANITATION, HEATING AND VENTILATION IN BUILDINGS

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THIS MONTH'S COVER

Speed reducing gears that harness steam turbines for ship propulsion are machined with exceptional accuracy in an air conditioned gear-hobbing room at the South Philadelphia Works of Westinghouse Electric Corp. The allowable error in spacing teeth is 0.0001 inch. Air conditioning has aided in making such control possible.

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WARMING THE AIR

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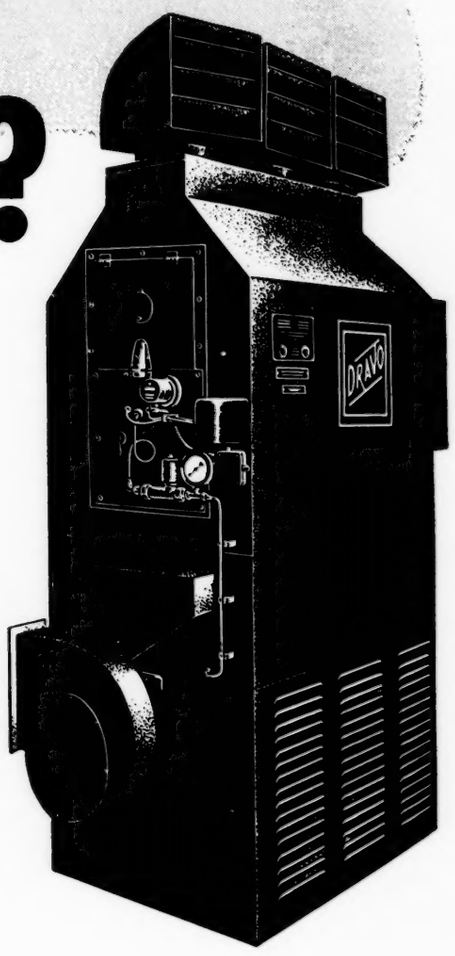

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Washington News

LORING F. OVERMAN

NOW it's official. The inflation threat which, at election time, was to require standby government controls, is now a *deflation* threat, also requiring standby powers!

As of last month, official Washington was trying hard to make up its mind which way the business winds were really blowing. The President was still demanding that Congress enact expensive new welfare programs, bow to the "mandate" to repeal certain labor legislation, and increase taxes by $4 billion "as a brake on inflation."

Some within Congress were lifting moistened fingers to the breeze, and concluding that the wind had veered. So were a number of prominent Government economists. Conclusions were not unanimous, and remained divided as of June 1, but these changes were apparent:

1. A strong economy bloc was making itself heard within Congress.
2. A new Economy Expansion Act of 1949, labeled as a possible brake on deflationary forces, should any develop, was being readied for introduction in the Senate.
3. An anti-deflation public works bill previously passed by the Senate, was reportedly given Budget Bureau approval for release to the House.
4. Talk of a tax increase was yielding to a proposal to collect corporation taxes on 1949 business on a stepped-up schedule.

Juggernaut Still Rolls

Despite the appearance of these new trends in legislative thinking, the Congressional Juggernaut rolled on under the inertia of past goadings. It seemed likely that before the economy pressure became too great, the House might act favorably on the Senate-approved Administration-sponsored multi-million dollar housing program.

The House version of the bill, approved by the Banking and Currency Committee and slated for action on the House floor early in June, added $3 billion in commitments to the Senate bill's $16 billion total. The House bill provides for a five-year program of slum clearance in cities; for 1,050,000 low-rent housing units within seven years, and for farm housing aids. The Senate bill is along the same general lines.

Twice before, the Senate has passed similar measures only to have them killed in the House Rules Committee. Under new procedures, this committee can no longer withhold controversial measures indefinitely, but must bring them up for debate and vote. The newly-inspired economy bloc within the House has promised a strong attack to defeat the measure. Recalling that the Senate passed its bill by a 57 to 13 vote, it remains to be seen whether the winds of Congressional thinking have changed sufficiently to block passage.

Some members of Congress have complained that although they, themselves, now see clearly the necessity for economy in government rather than increases in taxes, there is still not sufficient expression of similar thinking from constituents to warrant all-out support of spend-less programs.

Economic Expansion Act

Widely discussed in Washington as being ready for early introduction in the Senate is a bill, the Economic Expansion Act of 1949, which indicates that President Truman may at last be becoming convinced that the business cycle is not still spiraling upward. It is said that increasing signs of a recession have convinced advisers that now is the time to introduce this bill.

The Economic Expansion Act would give the President power to intervene in various ways to expand capacity and increase employment in 14 industries—steel, iron ore, freight cars, manganese, chromite, copper, lead, zinc, beauxite, aluminum, synthetic fuels, electric power, timber, and fertilizers. The introduction to such a project was included in the President's annual message to Congress.

As a make-work expedient to be undertaken while additional steps are being worked out, the proposed measure would authorize the Public Works Administrator to get busy at once on blueprints for public construction that can be readily begun; the Government should make grants to localities to help them do similar planning, and the President should be awarded special powers to aid faltering industries. This would include awarding of government contracts and the right to lend money to individual workers to permit them to shift to other localities.

The Act also proposes empowering the President to rehabilitate Government-built war plants in the event of need; construction of needed plants or equipment, which must be leased to private companies for operation; loaning of Government money for plant expansion, with provision for amortization deductions in unprofitable years; government insurance of private loans for plant expansion up to 90% of the total provided, and insurance for bank loans to small business, or direct loans to small business.

The bill also proposed continuing studies to determine the extent to which private monopoly impedes industrial expansion.

The proposal has not proceeded sufficiently far to hazard a guess as to what its fate may be when it runs into the new Congressional economy bloc, but that its sponsors are quite serious in making the try is indicated by the fact that Phase One, the Public Works stop-gap, is slated for an early test.

Public Works Blueprint

The Public Works authorization measure, known as the Chavez bill, has already passed the Senate. Its avowed purpose is to set up a Government building program for immediate use in case of widespread unemployment. In recommending passage, the Senate

ECONOMICAL-

USE-

Mastrol

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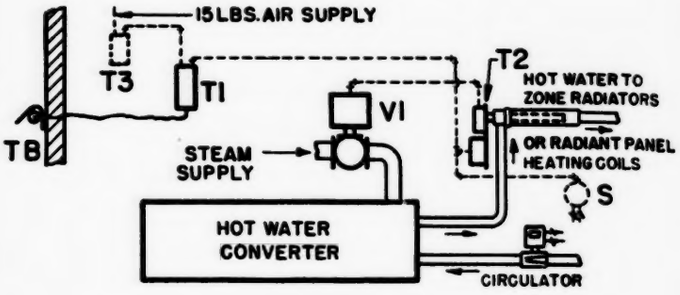
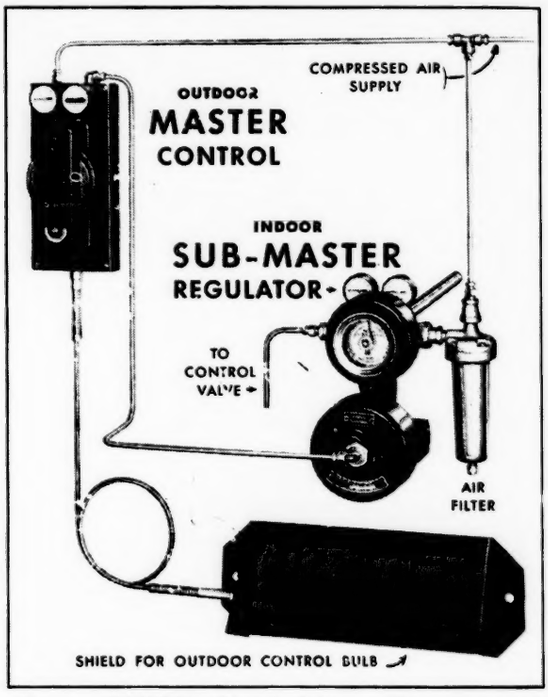
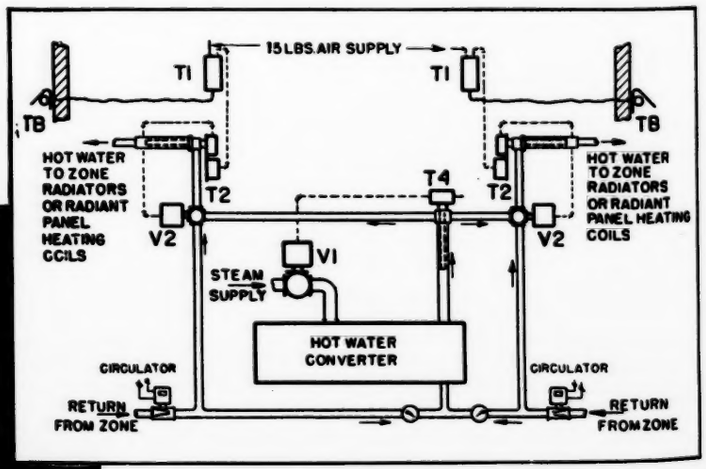


Above, POWERS MASTROL System Controlling Hot Water Supply for Single Zone with Pilot Room Thermostat. TB-Outdoor thermal bulb and shield. T1-Master control, T2-Sub-master regulator. T3-Pilot thermostat 68°F. for quick warm up (optional). V1-Diaphragm control valve for steam. S-Switch to automatically stop circulator when outdoor temperature is above 60°F., (optional).



Powers MASTROL Control System — One of several combinations of Powers Master-Sub-Master controls for Forced Hot Water Heating Systems.



MASTROL System Controlling Hot Water for Multiple Zones Using 3-Way Water Mixing Valves—TB-Outdoor thermal bulb and shield. T1-Master control. T2-Submaster regulator. T4-Regulator for Maximum hot water control. V1-Diaphragm Control Valve for steam. V2-Three-way water mixing valve.

Committee on Public Works reported, "The bill will fulfill the need to build up a storehouse of plans now against the day when Government building programs may become necessary or desirable because of economic conditions." The measure has three aims:

1. To authorize appropriation of $40 million to buy sites and prepare plans for public buildings outside the District of Columbia.
2. To acquire additional lands within the District and to transfer properties outside the District from one Government Agency to another "for the purpose of better utilization and administration."
3. To provide $30 million "for acutely needed renovation of Federal buildings outside the District of Columbia." This would apply only to major repairs and would not be used for jobs costing less than $25,000.

A Door-Opener

Washington observers say that the program has the blessings of the Budget Bureau, and since the initial amounts involved are "only" $70 million, it is possible that this could be the door-opener to far more ambitious make-work plans. In support of the measure, proponents observe that construction of the type contemplated was postponed during the war, and again after V-J day. The wartime postponement was due to scarcity of materials and labor, and the post-war deferral to a desire to channel both into housing for veterans, and delayed factory and commercial construction.

It is also contended that there are pressing needs for such buildings as post offices, Federal courthouses, etc. The Federal Works Administrator has estimated that $2 billion could be profitably spent next year in these categories, since the cost could be amortized in 15 to 20 years by savings from rents paid by Government Agencies, by increases in efficiency, and similar items.

Demand for new buildings for postal use is reported as particularly heavy, due to shifts in population and increased use of parcel post services. The Senate Public Works Committee report stressed another feature of the bill—the fact that it sets a pattern for public building construction.

"Unless a sound policy is established for handling bills of this type, it is anticipated that there will be a flood of additional individual bills," the report observes. "At present there are about 4,000 such proposed and needed buildings to be constructed throughout the country. The Committee is not equipped to pass on the merits of eligible Federal buildings and make priority selections."

New Budget-Balancing Idea

Unique even in a city famous for novel legislative ideas is the latest proposal to balance the budget.

The proposal starts with the premise that a $2 to $3 billion deficit is in sight for the 1950 fiscal year; that increasing taxes by $4 billion, as urged by President Truman, is unpopular; that economy, while nice to talk about, can go only part of the way, if any.

The happiest solution would be to balance the budget without either economizing or raising taxes. And that's just what the latest proposal has in view! All that would be required is a speed-up in payment of corporation taxes. Instead of paying 1949 taxes within 12 months, as is now permitted by revenue laws, corporations would be required to settle up within 6 months of the end of the year.

Advancing the collection date would shift an additional $5 billion into fiscal year 1950, providing more than enough to balance the budget in that year. The first half of 1951 would also profit somewhat, but after that the favorable bookkeeping balance would disappear.

There's a lot of talk about this new plan in Washington, with Republicans opposing it as a bookkeeping trick to cover up big spending, and with Democrats eyeing it as a possible solution to their problem of how to spend more and tax less. Some, desirous of matching the tax reduction credited to the 80th Republican Congress, can see in the proposal a way to balance the budget and at the same time reduce excise taxes.

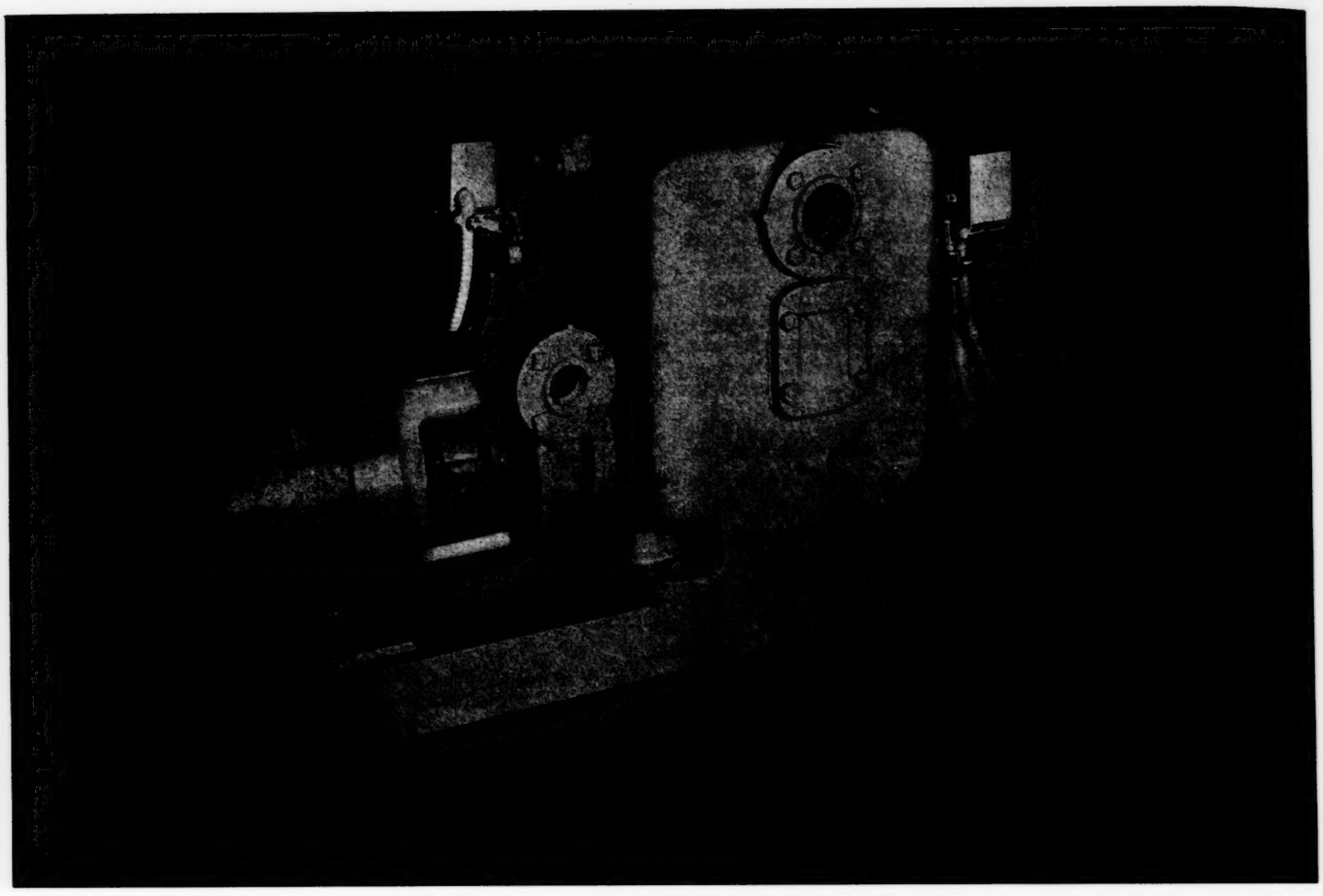
Reduced to its simplest form, the proposal simply means that the Treasury would merely be spending next week's pay check this week. It would be fun while it lasted, but 1951 would be the year of reckoning. Few individuals would choose this form of fun in handling their own finances, but politics sometimes do strange things to logic. Prominent House Ways and Means Committee members—the men who originate tax proposals—are behind the plan. Strange as it may seem, such an idea could get the united support of the Democratic majority, for it would rob Republicans of a strong political argument which would be theirs in the event of a budget deficit.

Steel Shortage Over?

Two actions by the U. S. Department of Commerce, on May 18 and 19, respectively, offered additional evidence that the nation's production of iron and steel has caught up with demand. On May 18, suspension of pig iron allocations under the voluntary plan covering the manufacture of cast iron residential housing items was announced. On the following day, Secretary of Commerce Charles Sawyer authorized immediate removal of export quota restrictions from 21 iron and steel mill products. For the third quarter of this year, only galvanized steel sheet; electrical sheets, transformer grade; iron and steel scrap, and tin and terne plate remain under export quotas.

The voluntary plan providing pig iron for residential housing items became effective in July, 1948, and made available approximately 100,000 tons of pig iron monthly for the manufacture of such critical items as cast iron pressure pipe and fittings, soil pipe and fittings, plumbing draining products, low pressure boilers, and iron castings for warm air furnaces. Results of a poll of manufacturers indicated that continuation of allocations under the voluntary plan was unnecessary. The voluntary plan itself, however, will remain in effect until September 30, permitting resumption of allocations should a change in supply conditions warrant such action.

MAXIMUM EFFICIENCY FOR STEAM HEATING SYSTEMS ON HEATING, DRYING AND PROCESS WORK.



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Full automatic control is furnished by means of a ball float and float switch mechanism mounted on the receiving tank. All wiring is made up at the factory, and it is necessary only to connect the pump to the system and hook up the leads. Complete information regarding these economical pumps sent promptly on request.

THE NASH ENGINEERING COMPANY

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Control System Has Careful Operation Saves 30% of Fuel

This article describes the heating system at Notre Dame as it existed some years ago, the problems with that system, the system of control installed later, the method of operation of the new system, and concludes with a discussion of the experiences with and advantages of the present arrangement.

FIFTY buildings on the campus of the University of Notre Dame are heated from a central plant by steam circulating through two and a quarter miles of tunnels, as shown in Fig. 1. The steam is generated in four boilers, each with a maximum operating capacity of 35,000 pounds of steam per hour at 130 lb gage pressure and 410F steam temperature. The boilers are fired by chain-grate stokers, burning Indiana bituminous coal.

The steam distribution tunnels average 6 ft by 6 ft in cross section. The largest heating main, supplying thirty-three buildings, is 20 inches in diameter at the start at the reducing valve near the plant, and is reduced in size until it is 8 inches at the far end, about 3000 feet distant. Ten vacuum pumps, at various locations over the campus, plus the main pump in the boiler plant, return all condensate from the system to the plant. The total connected heating load is 314,262 sq ft of equivalent steam radiator surface, including the loss in the tunnels, which amounts to 7000 lb of steam per hour.

Former Method of Operation

Prior to two years ago, the method of operation was as follows: Only sufficient pressure was carried at the reducing valve to reach the ends of the system. This pressure varied from 1 pound in mild weather to 3 pounds in cold weather. Steam was left in the mains continuously during cold weather, the pressure being dropped to about 1 pound at 10 p.m. and raised to 3 pounds at 4 a.m. From November 15 to March 15 three boilers were used. The temperatures in all buildings were uncontrolled, excepting only a few of the newer buildings in which a few of the rooms were thermostatically controlled.

Heat Control System

In 1944, when the coal supply began to approach the critical state, consideration was given to the installation of motorized valves at the dormitories and college buildings. This would enable heat to be shut off in buildings not occupied at night, Sundays, holidays or any period in mild weather. However, after much deliberation, it was decided to extend the project to control the heat in the buildings as well.

The system which was finally installed is so arranged that the campus is divided into 35 zones. The system consists essentially of the following: an outdoor thermostat and a control panel installed in the boiler plant; in each building is a relay, pressure differential regulator, indicator, control valve, and metering orifices in the radiators.

The pressure differential regulators maintain a constant pressure differential across the orifices in each radiator whenever the valve is open. The control valve is a motor-operated valve in the steam line to the building, under control as described later. A typical control valve is shown in Fig. 3.

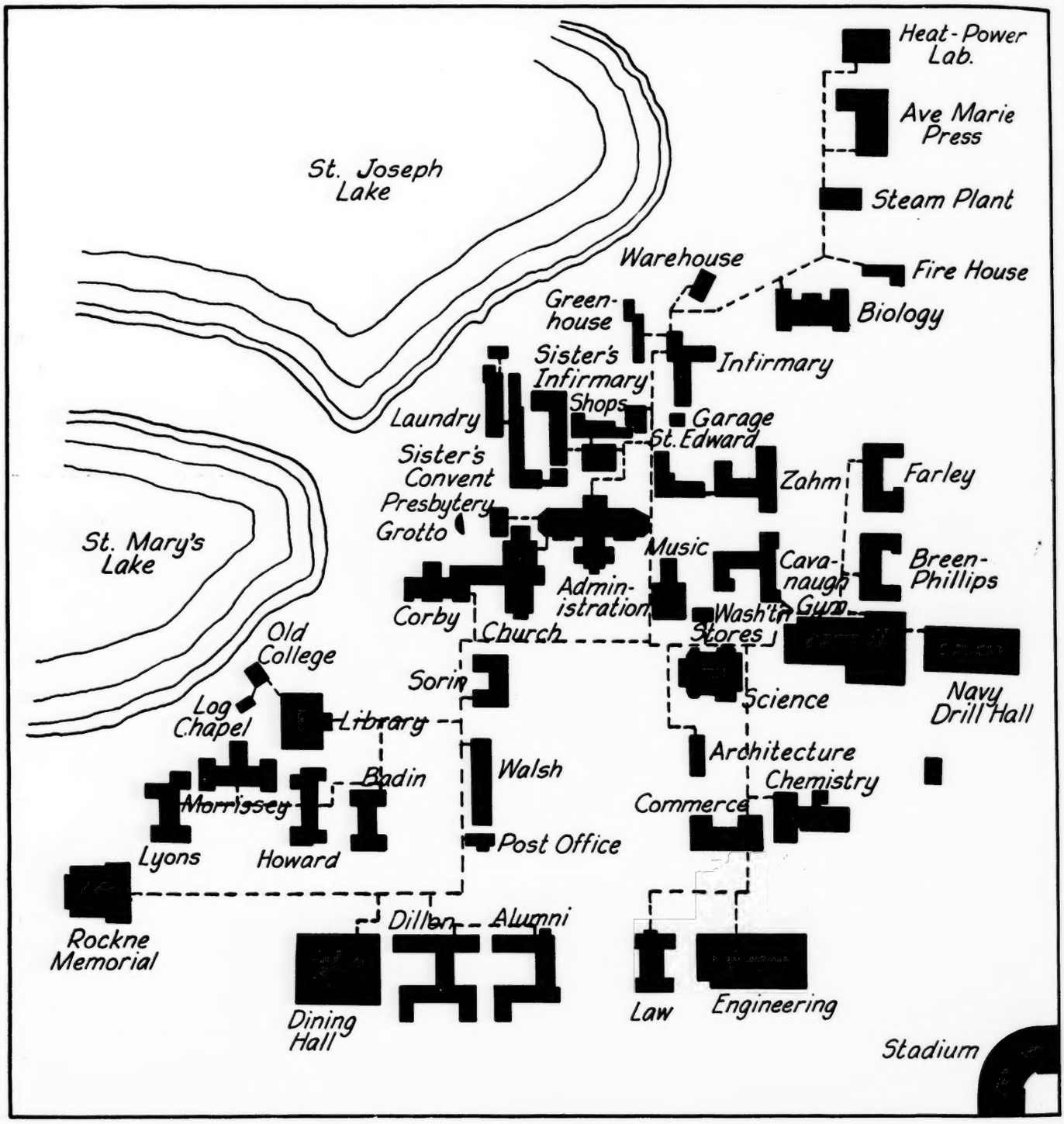

Fig. 1. Sketch of plot plan of University. Dashed lines show tunnels for piping.

The control is a pulsating flow control system and works on a definite time cycle. Fig. 2 shows the temperature-time cycle relation of the 15 min. cycle used. On a cycling control with more than one zone, operation may vary so that all zone valves open or close at the same time; in other words, all zones get in step. As can be seen, this is to be avoided, as the demand on the boiler could be badly distributed with respect to time. Therefore, the control used on this installation incorporates a means of synchronizing the zone control so that when the equipment is working automatically the heat demand of different zones will never. to use an electrical analogy, be "in phase."

Mounted on the central control panel (Fig. 4) is a group of manual controls for each zone. A selector switch, one for each zone, allows the operator to (1) open the control valve for maximum heat, (2) close the valve for no heat, or (3) place the valve under automatic operation. When the control valve is under automatic operation, the percentage of heat delivered can be manually increased or decreased by use of a variator, one for each zone.

Automatic operation is as follows: Inside the control cabinet there are revolving cams designed to produce the time cycle shown by the curve in Fig. 2. The outdoor thermostat (Fig. 5) moves this cam in relation to outdoor temperature so that for any given temperature the control will always assume the same posi-

tion and produce the same predetermined time cycle. There are also lights on the panel to indicate when steam is on in the heating system in each zone. A manual temperature selector switch is used (actually a manually-operated equivalent of the outdoor thermostat) so that the delivery rate to all zones can be gradually increased or decreased and the boiler load conditions adjusted to take care of this variation without the usual upsetting effect in the steam generating plant when a large load is charged on the heating mains. On the control panel in the boiler room there are also a number of separate zone control switches that permit the control of blast heating, unit heaters, and other similar loads from the one key point.

Located in each building is a control cabinet for supplying current to the motorized control valve. Inter-connecting the central control and the various building relay cabinets are electric cables installed in the tunnel system. Fig. 6 shows a typical arrangement of equipment in one of the buildings.

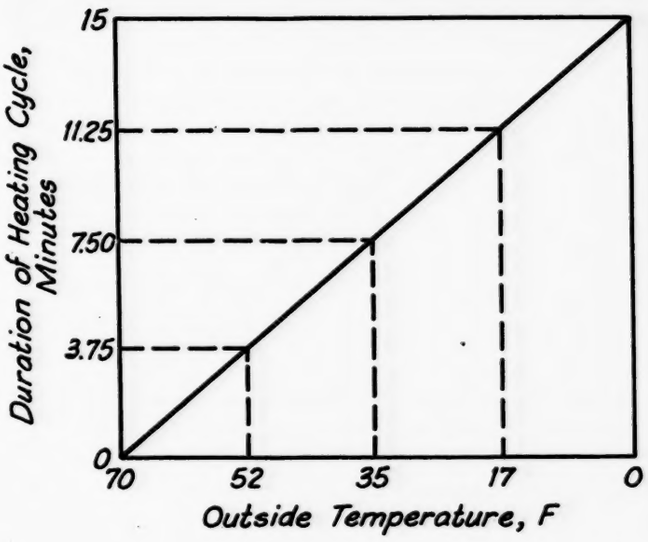

Fig. 2. Graph of time cycle.

Load Conditions Analyzed

To synchronize the loads and prevent undue fluctuations in boiler output which lead to inefficiency, it was necessary thoroughly to analyze the load conditions and prepare a load curve to determine the effect of increasing and decreasing various heating loads. The greatest load variation is approximately 10 to 15%.

Although there are presently 35 zones, the control panel is equipped for 36 zones, and provisions were made for future expansion on the campus with 12 extra zone control switches. These extra zones will operate in parallel with 12 of the present automatic switches. Provisions are also made for addition to the control panel if this should prove necessary.

Fig. 7 shows an indicator used in the plant. The outer numbers indicate zone sequence. The number of zones on at any one time is proportional to the outside temperature. The outer row of lights, which are green, indicates a differential in the zone, while the inner row of lights, which are red, show valve operation. The time lag between the red and green lights is an indication of steam response to valve operation. The area of each segment shown in the center is proportional to the steam load of the zone.

The control system handles a net load of 203,000 sq ft of radiation. Individual zones range in size from 746 to 20,900 sq ft of equivalent direct radiation. Five pounds pressure is carried on the mains at the reducing valve; pressure at the ends of the mains falls to about 3 pounds in the coldest weather. The vacuum pumps are set to operate at a vacuum ranging from 3 to 7 the tunnel system. Fig. 6 shows a typical arrangement at the valve.

Early Experiences with Control

When the control system was first placed in operation, all zone temperature controllers were set at nor-

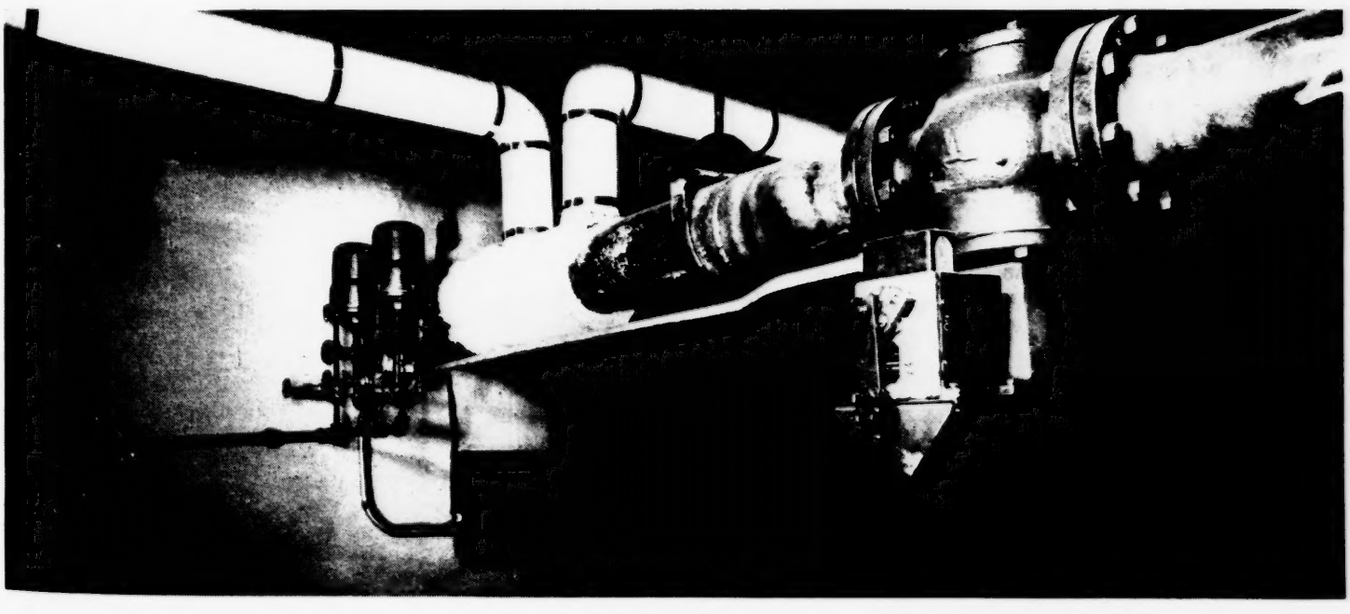

Fig. 3. Motor operated control valve. This one is located in Zahm Hall.

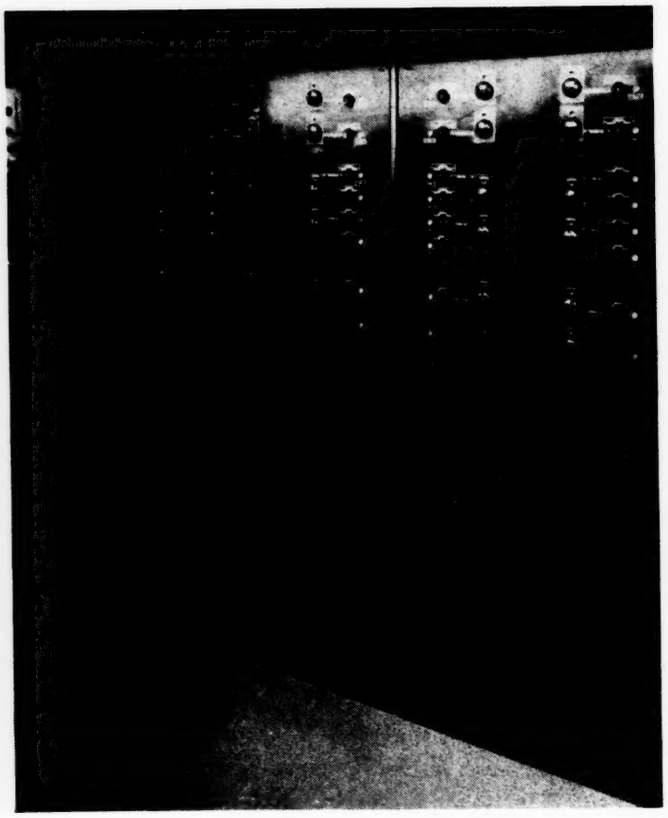

Fig. 4. Central control panel in the power plant.

mal. The outside thermostat was switched to manual and gradually brought down to a point 20F or so less than the outside temperature and left that way until it was believed that the zones had a proper warm-up. At night and on holidays, classrooms and other unoccupied zones were cut to one-half normal heat as soon as occupancy ceased. The dormitories were cut back between 10 and 11 o'clock at night, the outdoor thermostat set to manual and adjusted to about 20F warmer than outside temperature and left this way until the morning warm-up.

Whenever a heat complaint was received, the individual zone was set to full heat for one-half hour and then switched back to automatic. If the demand for heat persisted, the temperature variator for the zone was stepped up.

System Reexamined

Heat complaints became numerous to the point where attention began to be paid to the heating system itself. The system was maintained by the University pipe shop and had no scheduled maintenance. Drip traps wide open, partially plugged radiator traps, bad vacuum leaks, and windows that would not close were just a few of the reasons for complaints. Whereas the system had previously worked under constant pressure, buildings were not properly heated under zone control. In addition to this, orificing of the radiators had not been completed and the steam pressure in the mains fluctuated between 3 and 5 pounds at the valve, due to sluggish reducing valves. The differential pressure on some zones also had to be raised to insure proper heat.

The season was two-thirds gone before most of these troubles were eliminated. A closer study of the savings that were being effected or would be possible by heat control was then undertaken.

The system was placed in operation at the beginning of the 1947-48 heating season. The savings in fuel in October, 1947 over October, 1946, were 1.175 tons of coal per degree-day. For November and December the savings over the corresponding months of the previous year were 0.090 tons per degree-day, for January 0.120 tons, and none at all for February. It was then that it was realized that the control system would take a long time to pay for itself unless it was carefully used as a tool to accomplish the desired savings.

Consequently, night and holiday heat schedules were rearranged; morning warm-up schedules were laid out in such a way as to permit a gradual loading of the boilers, overheating in the warm-up period was eliminated, and warming up of unoccupied buildings as required, instead of several hours before, was initiated. All this brought very good results. The savings for March, 1948, were 0.167 tons of coal per degree-day, while the April and May savings were 0.600 and 1.030 tons per degree-day, respectively, as compared with the corresponding periods in 1947.

Changes in Boiler Plant

After working with the control system during the first season, it became increasingly apparent that by making some changes in the boiler plant equipment, important fuel savings could be realized. Work was begun on this. Refractories were installed which would permit carrying peak loads for a much longer period. The combustion control was revamped from a positioning type to a metered control. This enables more efficient operation under a fluctuating load.

Changes in Control and Operation

New reducing valves were installed to replace the sluggish ones and, as a result, a constant pressure is

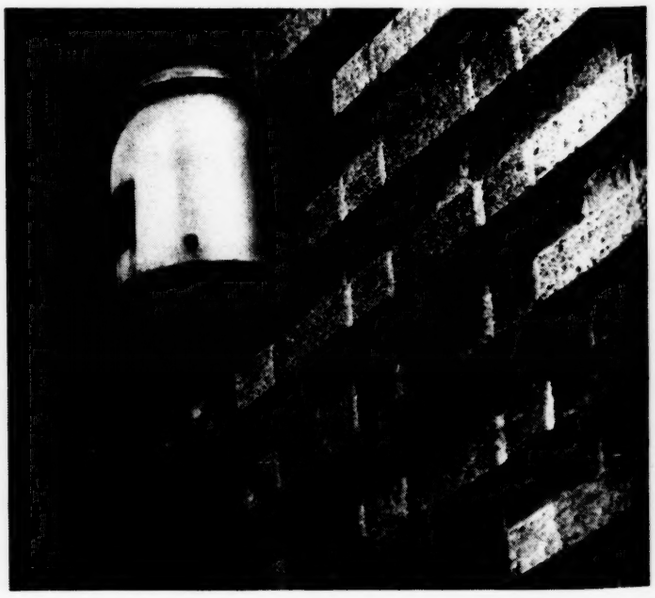

Fig. 5. Outdoor thermostat mounted on the North wall of the power plant.

now maintained on the heating main at all times. To obtain more accurate figures in determining steam costs, flow meters were installed on various steam lines. The zone sequence on the control equipment was rearranged to produce a flatter load curve.

Second Season Operation

The second heating season (1948-49) was started with schedules laid out from experience gained during the previous season. Morning warm-up schedules are now fairly uniform throughout the heating season. They are altered more in the fall and spring than in the winter months. Evening shut-off schedules are adjusted constantly throughout the heating season, the main purpose of this being to let the zone fall to a temperature during the off period that will fit the morning warm-up schedule.

Results

The new system of scheduling heat has proved satisfactory. There is now very little overheating and complaints are at a minimum.

Up to March 15 of the current season (1948-49) fuel consumption has averaged 1.157 tons of coal per degree-day and it is apparent that this average can be maintained through the rest of the season. This compares with 1.621 tons per degree-day for the last season prior to installing the control, and 1.401 tons per degree-day for the first season under control. Therefore the savings in coal with the control as presently operated compared with no control total 2784 tons of coal per heating season of 6000 degree-days.

It is safe to assume that the combustion control and high temperature furnace brick will pay for themselves this season. The balance of the savings will provide a very good return on the heat control investment. It must be pointed out, however, that in this particular plant, neither the boiler plant equipment nor heat control would return as large a percentage of the investment as they have unless they are carefully used as tools in combination to achieve the final results.

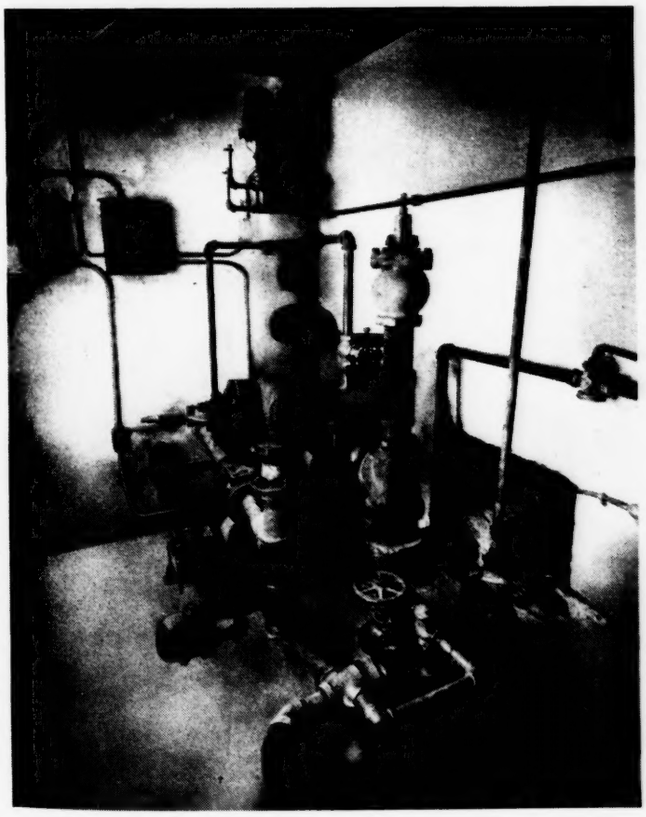

Fig. 6. Typical equipment room showing control valve near floor at right and control cabinets for two zones on the wall.

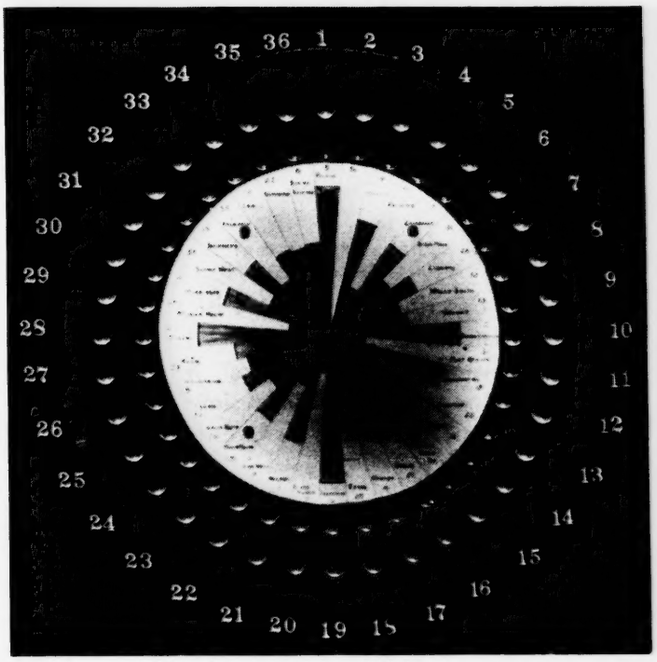

Fig. 7. Indicator showing sequence of zone operation. Outer row of lights shows differential in each zone, inner row indicates valve operation.

An illustration of the foregoing point is in the practice of setting the heat control thermostat to manual position and cutting back the heat supply for about one-half hour in the mornings while the laundry is starting up. This has only been done in severe weather while operating two boilers under peak loads. The refractory enables continuous operation at high ratings. The combustion control keeps the fires in good condition and the heat control makes it possible to control load so that short peak loads can be carried without excessive pressure drop in the steam mains.

Conclusion

Conscientious operation of any control system by the personnel responsible is essential in achieving satisfactory and economical results. Only by following schedules carefully can comfort to the occupants of buildings be assured. The planning of a schedule involves a knowledge of the characteristics of the heating system in its entirety, such as condition of piping, age and condition of buildings, together with a thorough understanding of the operation of a system.

Last but by no means least, no zone control can be expected to give complete satisfaction to each individual occupant of a building. Each human being has his own individual idea as to what constitutes comfort, so that the most that can be hoped is that the majority will be satisfied.

Present English Practice in Cotton Textile Process Ventilation

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This article describes a recent trip to the Shirley Institute, Manchester, and several cotton textile mills in and around Manchester, England. It presents some concept of the progress British investigators have made in cotton textile process ventilation.

THE Shirley Institute (British Cotton Industry Research Association), Didsbury (Manchester), is a unique organization primarily for research to improve the processing and manufacture of cotton textiles. It is also doing work on other textiles as rayon and linen. Linen work, however, has recently been transferred to a separate research institute. Shirley is supported jointly by British cotton and textile machinery manufacturers and the British government, an arrangement not often seen in our own country. The Shirley Institute has a staff of about 450 persons working on fundamental and applied research problems on textiles and textile processing. Extensive work is not conducted on cotton ginning and nothing investigated on plant genetics, such as is done in this country at the U. S. Cotton Ginning Laboratory and various agricultural experiment stations.

Byssinosis, a lung condition allegedly due to the inhalation of cotton lint and allied dusts, is a compensable occupational disease in Britain. Every year several workers are awarded compensation and retired from active work in mills because of this disability. British cotton manufacturers have therefore been forced to do more in reducing dust and lint concentrations in all potentially hazardous operations than have American mills.

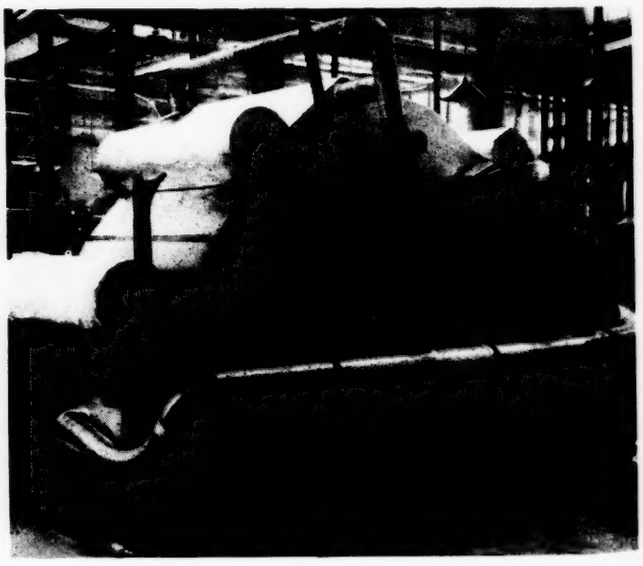
The Shirley Institute was requested to do investigational work to reduce dust concentrations in card rooms. As was pointed out in a recent article (Progress Report on Ventilation for Cotton Textile Processes, HEATING AND VENTILATING, October 1947), there are few if any ventilated card room installations in the United States except for asbestos fiber operations. The work at Shirley has been primarily devoted to carding machine and opener ventilation. At the present time, much of it has been confined to laboratory studies of the carding operation.

Carding Ventilation Studies

The institute is unique in that it contains a small cotton textile mill with complete machinery installed and operated for research projects. It was thus fairly easy to take a carding engine from their regular line of machines, completely enclose it, Fig. 1, and measure dust and lint evolution in different phases of the carding process. This carding engine is not significantly different from those used in the United States. On this machine, ventilation is provided at several points: an exhaust is located on the dust box just below the take-in roll (as the English call it) actually where the lap is supplied to the roll at the inlet; ventilation is provided over the flats; at the revolving flats brush; and also at the doffer roll. Other points are also ventilated, as desired, by flexible hose connections.

By using different hoods, it was possible to determine the amount and nature of dust generated at each point in the card. This was done by sampling air from the main exhaust duct connected to the desired hood. Sampling was done by a small alternating-current electrostatic precipitator which collected dust-laden air at a point three to six diameters below a diffusion plate shown schematically in Fig. 2.

I was interested in the nature of this diffusion plate since I had not been familiar with the use of this device. It consists primarily of a disc placed in the air stream three to six diameters above the point of sampling and shaped as in Fig. 3. Since the dust-laden air is forced around the annulus, it becomes well mixed and produces a uniform dust concentration so sampling can be conducted at one point and traversing is unnecessary. This device also creates a fairly uniform velocity across the pipe section. This diffusion plate, called the Stairmand disc, was described in *Engineering*, a British journal, in 1941. Other research persons may find it of value in their work. At the present time, it is being applied to other problems in our laboratory.



Courtesy, Shirley Institute

Fig. 1. Hooded card for study of points of dust emanation and ventilation requirements.

Results on the hooded card showed that over 50% of the dust generated came from the doffer roll region and the balance was distributed between the other points. The character of the dust changed from a high percentage of inorganic dust at the taker-in roll to primarily fibrous cotton dust or lint at the doffer roll region. Data on how much ventilation was necessary to completely remove all of the dust from the card were not available but approximate figures quoted were in the vicinity of 200-300 cfm on a completely hooded machine. This enclosure is not practical for commercial use since it makes the card inaccessible. Since the doffer roll emanations represent at least half of the dust disseminated, it is obviously advantageous to ventilate at this point. Adequate ventilation for this could be provided by a completely encompassing hood with a folding cover. Air should be withdrawn at 50-75 fpm through the small openings. Ventilation of cards in certain mills will be discussed later.

This hooded card, Fig. 1, has also been used to study methods for filtering cotton carding engine dust. The exhaust from the card is passed through filter units of various types for determining their effectiveness. This is done by providing a test section in the exhaust duct, Fig. 2, and taking air samples on the up-and-down-stream sides of the test section.

It is interesting to note that results observed in these tests show that fabrics used in English bag type filters were actually very poor for carding room dust. This is not necessarily true of filter materials used in this country since we have found that certain cotton ducks and wool give high collection efficiencies. The most efficient material Shirley investigators found for removing card dust was a resinated wool filter material developed by the British Chemical Defense Research Department.

It is simply made and consists of wool fibers and powdered urea-formaldehyde resin. The resin is put into the fleece during the wool carding by spreading it on entering material. The actual combing and brushing in carding charges resin particles on the fibers. This material yields an extremely high filtration efficiency for arsenical smokes and material of similar particle size. Resinated wool fleece permits penetration of less than 0.001% with smokes having an approximate mean particle size of 0.3 microns. Many investigators in England were very enthused about the possible use of resinated wool fleece for cotton dust filtration and other filtration applications. Its chief limitation is that the charge of the resin on the fibers dissipates after considerable use.

Oiling Studies

Another important investigation conducted at Shirley is a study of the use of oiling to reduce dust in cotton textile processing, particularly cleaning operations. While oiling cotton before processing is not new, objective measurements of its use have been limited. At Shirley, amounts as high as one per cent of oil have been added to the cotton. Use of one per cent oil reduces total dust concentrations to 0.1 of values obtained with unoiled cotton. A distinct disadvantage of this oiling procedure is that the cotton fiber apparently loses about 10% tensile strength, therefore most cotton manufacturers object to this step. Shirley investigators found that by reducing the oil concentration to 0.5% or less, only 3% strength was lost and air dust concentrations were reduced to one-third the unoiled values.

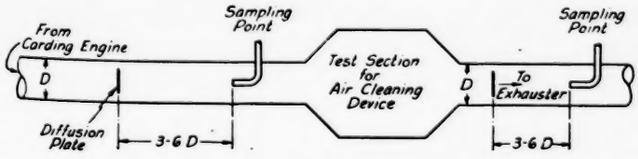
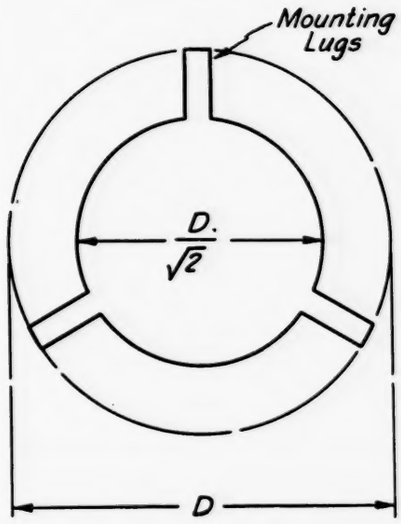


Fig. 2. Method of collecting dust samples from card exhaust duct, including filter or air cleaner test section.

Fig. 3. Stairmand disc or diffusion plate for duct sampling.

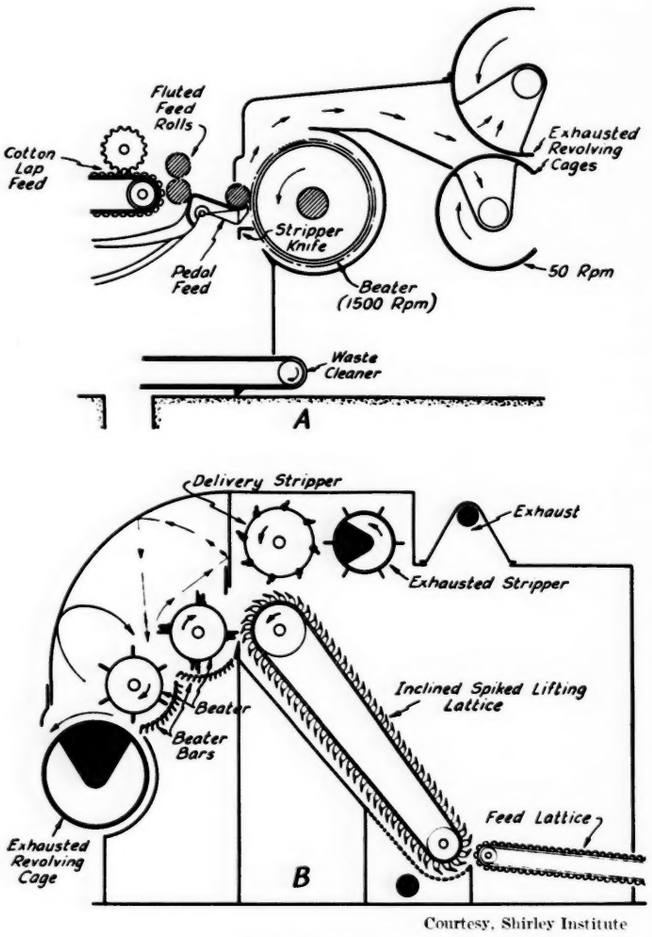


At the present time, an investigation is being made in a large English tire cord factory using 0.5% oil to study its effects throughout the cotton processing operations. Air samples in this mill show a beneficial improvement in general atmospheric dust and lint (fly) conditions. This is not in acccord with our studies which showed that although oiling aided early steps of the process, it did not control carding dust and fly where fine particles were eventually released. More data of this type is necessary, however, before oiling can be confirmed as a useful procedure. American cotton textile manufacturers are divided as to its merits.

Cotton Cleaning Research

Another important project at Shirley is studies in the design of improved cotton cleaning machinery primarily for removing trash but with concern for reducing dust emanation. For several years, investigators in this department have studied means of improving preliminary cleaning of cotton, and with the aid of a device known as the Shirley analyzer (a mechanical cleaner for assaying the amount of contaminants in cotton), they have investigated various types and modifications of cleaning equipment. The most successful unit they have found to date has been a machine similar in principle to their dust analyzer but made much larger to handle a greater volume of cotton. This device is called the Pneuopener and in its

early form was found to clean cotton as well as all the customary preliminary processing prior to carding. That is, it performed the work of the opener and pick-



Courtesy, Shirley Institute

Fig. 4. A, upper, present modified Pneuopener design. B, lower, modified bale-breaker used in conjunction with Pneuopener.

ing machines. (The British call these blowing and scutching processes).

The original Pneuopener in its early form was an effective cleaner but it also increased fiber breakage beyond a desirable limit. Some of the earlier designs, however, have been installed in mills and are performing reasonably well on operations not requiring long fibers. Developers of this equipment have continued their research and improved the Pneuopener to give good cleaning performance without excessive fiber breakage. In its present form, it must be preceded by some type of bale breaker to open the cotton and to form a lap which can be inserted into the Pneuopener feed. In its current design, fiber breakage from the Pneuopener is not critical. This has been accomplished by substituting a pedal feed for the roll feed used in the early unit. Roll feed is common to many cotton processing machines although pedal type feed was used on several early machines. It was my understanding that fiber breakage was reduced considerably with pedal feeding and that the present performance of the Pneuopener is excellent.

Details of the Pneuopener are shown in Fig. 4*A*. The machine differs from customary bale-breakers or feeder-blenders by containing a high speed rotating cage or perforated cylinder, which we described previously, for separating air from cotton in material conveying. These cages are used at slower speeds for return air filters or condensers. The type of opener recommended for use with the Pneuopener is shown in Fig. 4*B*. This opener is also provided with a cage.

In addition to development of the Pneuopener, investigators on cleaning machinery are attacking the problems by a fundamental approach. They hope to eliminate the carding engine from cotton processing by developing a "sliver" machine. A sliver is the carded web of cotton condensed into a long continuous round filament about ¾ inch in diameter.

Carding is a slow process and therefore restricts production. From ventilation considerations, the carding engine also adds a handicap since the large number of carding machines requires considerable equipment and air volumes. Another important factor is the large machine to operator ratio. One operator can take care of 6 to 20 carding engines and therefore there are few workers exposed to card dusts in any given mill. These factors resulted in practically no local ventilation for cotton carding operations.

Development of the sliver machine has continued for several years and it is still under investigation. The latest form of this machine at Shirley turns out slivers

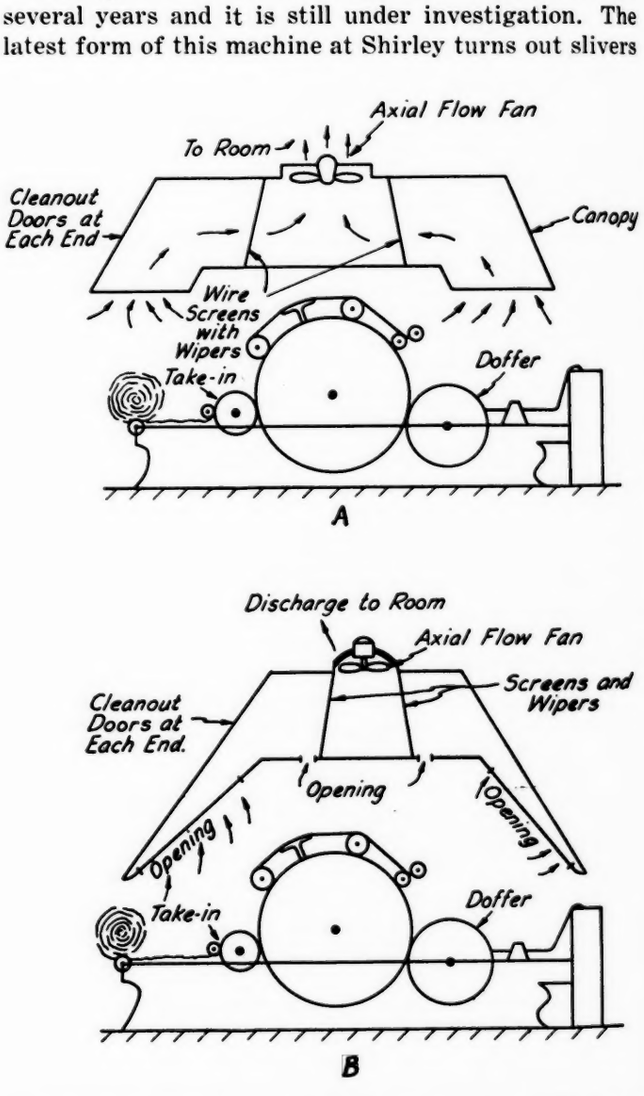


Fig. 5. A, upper, canopy exhaust for carding engine, developed by Atmospheric Control, Ltd. Canopy width is about 10-15% greater than card width. B, lower, improved form of canopy exhaust. Note that openings and ventilation are provided over the flats.

comparable to some carded slivers. The Shirley people feel that while the carding engine produces a certain amount of fiber parallelization, a large number of fibers still lie in considerable random position. The present sliver machine produces a sliver similar in appearance to a carded one, but not as well parallelized. Subsequent processing (spinning in particular) of this sliver has not been completely satisfactory and further studies are in progress. In its present form, however, the sliver machine is satisfactory for many uses such as absorbent pads, wadding and packing.

Field Investigations

In addition to my time at Shirley, the Institute arranged visits to three mills in and around Manchester with special ventilation and processing units.

The first, and most interesting, was J. Stotts of Oldham, a mill producing a heavy type of textile material largely used for conveyor belting. In this mill some carding engines were provided with ventilation. A separate room with twelve cards is used to study proposed equipment performance before installation on all cards. These ventilated cards, the manager informed me, have been satisfactory and the card operators prefer work in this room.

For demonstrating the performance of card ventilation, lights in the room were shut off and a projection lamp was directed towards the card. It could be clearly seen by the Tyndall effect that lint and dust were captured by the hoods. The escape of finer lint from the canopy fan could also be seen, indicating that the lint and dust collector was not efficient.

Although the performance of this installation was not particularly impressive, I believe the method of ventilation has considerable merit and is worthy of description. This ventilation is accomplished by overhead canopy type hoods as shown in Fig. 5. It is my understanding that these overhead ventilation devices are developments of Atmospheric Control, Ltd., Manchester, England, protected by British patents.

Two types of these overhead canopies have been used. The one shown in Fig. 5*A* is the earlier type and Fig. 5*B*, the later model. Incorporated in the design of this overhead canopy are openings located over the doffer roll and knife and the take-in roll. These are positions which the Shirley investigators found

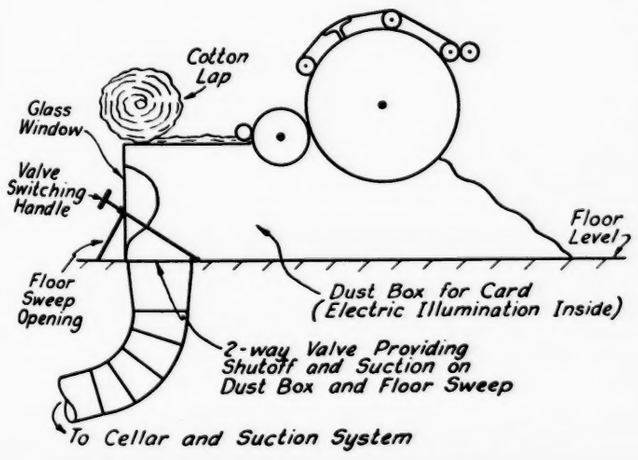

Cotton Lap
Glass Window
Valve Switching Handle
Floor Level
Floor Sweep Opening
Dust Box for Card (Electric Illumination Inside)
2-way Valve Providing Shutoff and Suction on Dust Box and Floor Sweep
To Cellar and Suction System

Fig. 6. Card dust box and floor cleaning system.

to be major points of dust emanation. The internal mechanism of this canopy contains fine mesh wire

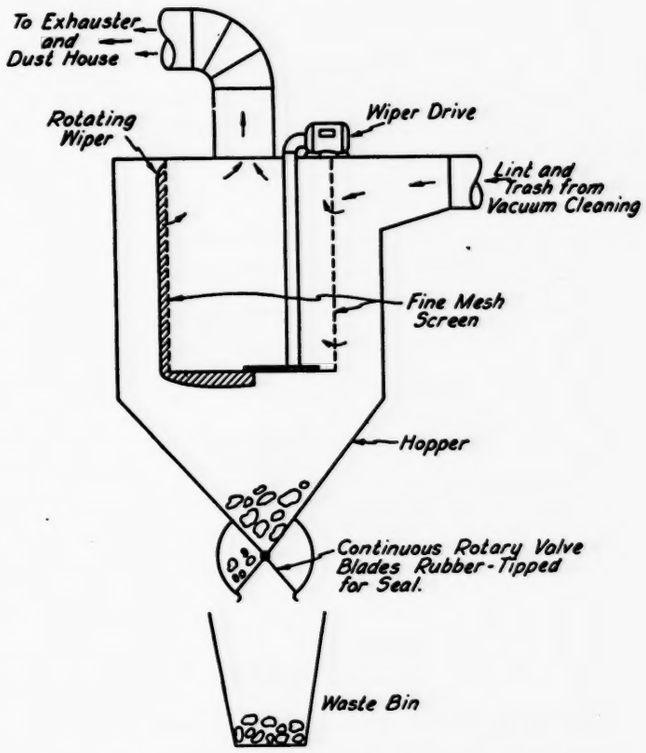


Fig. 7. Rotating cotton waste removal apparatus.

screens, probably 100 to 150 mesh, for the exact size was not known at the mill. These screens are kept clean by a traveling wiper, similar to a windshield wiper, which travels slowly across the screen removing the collected lint. This lint mat acts as an air filter (of low efficiency).

Ventilation is provided by an axial flow fan driven by a 1/3 hp motor or a belt from the carding engine. Bins in front of the screen where the lint falls are cleaned frequently. The air flow appears close to an adequate amount as judged by the lint entering the hood faces, but unfortunately the filter is not efficient and fine lint is not retained and thus returns to the room. Considerable improvement could be obtained if the card ventilation fans were vented to the outside. I attempted to get values of ventilation rates used but could only get a very approximate figure from the management. The manager thought it was approximately 2,500 cfm per card. Judging from the type and size of fan and the resistance of the canopy and screens, I estimated the figure was closer to 1,500 cfm.

Another unique feature of this card room, and one which performs very effectively, is the use of a suction clean-out arrangement, Fig. 6, at the box below the take-in roll. With this clean-out suction, it is possible to clean the card box and the floor as well by means of the two-way damper valve shown. This system is essentially a vacuum cleaning system and is not in operation except when the carding engines and room are cleaned. It cleans the card box well and prevents the usual contamination in the room caused by sweeping or air hoses. Discharge pipes for this suction system convey the exhausted material to the basement.

In this location there is also a very good separating installation which makes use of a rotating wiper screen cleaner exhausted to the atmosphere. The lint, fly, and trash collected by this device is transferred to bags and is removed as cotton waste for use elsewhere. The rotating wiper and screen for cleaning is shown schematically in Fig. 7. Of interest in this particular case is the fact that the discharge from screens is exhausted to the dust house and then the atmosphere as is common in several American mills.

An interesting feature of the collecting device, shown in Fig. 7, is a rotary valve similar to that used on some pneumatic conveyors in this country but not usually used for removing cotton or dust from collecting systems. I believe this is a feature which can be well used in other dust collecting equipment for continuous removal of collected material. This cleaning equipment including the vacuum cleaning system is also the development of Atmospheric Control, Ltd.

My second trip in Manchester was to the Era Mills located in Rochdale, a small community outside of Manchester. In Rochdale I saw an effective opening machine ventilation installation which the plant engineers had designed. The ventilation was installed on a Barton opener, Fig. 8. By providing a perforated grid just above the small knock-off roller for removing cotton from the spike feed, it is possible to knock considerable dust from the cotton bunches or clumps torn off in opening. This dust is exhausted to the dust house. Again I could not get exact figures of ventilation but the manager gave me an estimate of approximately 1000 cfm per opening machine. I found that this room, in which there were four bale-breakers or openers, was one of the cleanest opening rooms (the British call them blow rooms) I have ever seen. The grade of cotton used was not particularly high (strict low middling American) and would produce considerable dust if the openers were not well ventilated.

The third trip was to visit a card room and observe spinning operations at the Knowles Mill in Manchester. There I saw a card room in which some experimental ventilation was being tried. A very high grade of Sea Island type Egyptian cotton was used. The only card ventilation was a small canopy hood located above the doffer roll and knife. Supply air was provided on the other side of each card. The exhaust system was quite ineffective since the hoods moved very little air and were located about 3 ft above the doffer roll and knife where they could not possibly control much lint and dust. One of the best features of this installation, however, was the dust separating system. Exhaust from the small canopy hoods was piped to the cellar and then passed through a large rotating air filter, basically a slow moving cage. This cage was stripped by a suction unit, the discharge of which was conveyed to a very large cotton fabric bag approximately 15 to 20 ft long and 3 or 4 ft in diameter. This bag and its contents are removed and cleaned at intervals.

The most interesting unit at this mill was a spinning frame equipped with a suction device for reducing "ends down." This device is called a Pneumophil and I was informed that 50% of the textile mills in Switzerland utilize this system. It consists essentially of a trunk suction system located along the spinning frame with small holes placed at each bobbin near the spinning ring. The thread coming off the bobbin passes near the suction opening where some fly was removed. This lint was conveyed to a fine mesh screen exhausted at the end of the trunk by an axial flow fan. Clean-out doors were provided at each end of the trunk. This trunk is therefore a large plenum under exhaust and discharging through the screen. The amount of lint which accumulates is not enough to require cleaning more than once per day or per shift.

While this device is not primarily a ventilation unit, it does reduce the amount of lint settling on the spinning frame. The manager of this mill informed me that they could not give a real assay of the performance of this unit because it was the only one in a large room with several ordinary spinning frames. There are mills in this country equipped with this system but they are the exception rather than the rule. Some German and many Swedish mills also utilize this system. Performance figures regarding lint, fly and dust concentrations in rooms equipped with the Pneumophil as compared to ordinary spinning frames are lacking. Such information would be worth while obtaining. One of the operating and maintenance advantages of this system is that there are less "ends down" and the attention of operatives is reduced considerably.

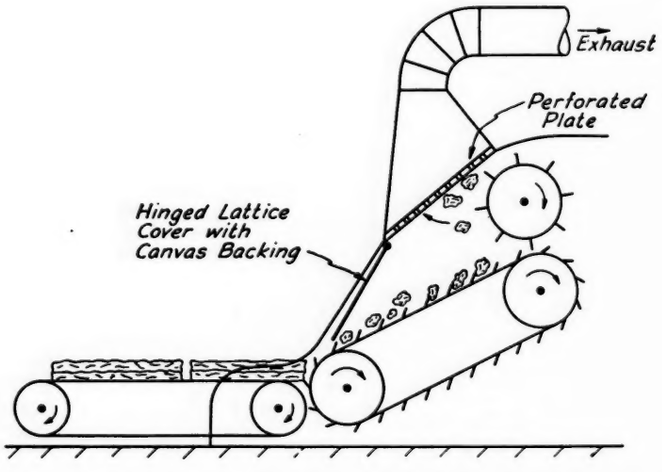


Fig. 8. Barton opener equipped with ventilation and dust removal plate.

Acknowledgements

I would like to acknowledge the kindness of the Shirley Institute for their time and courtesy in showing me the important phases of their work on cotton cleaning and dust control and for permitting me to publish my observations. The cotton dust problem is international in scope since it concerns working conditions in textile mills throughout the world. The Shirley people feel it should be solved as soon as possible for the benefit of all concerned. Thanks are due to Mr. Lobb, who was in charge of the Institute at the time of my visit, Messrs. Thomas, Charnley, and Brownsett of the Institute for special assistance; to the managements of Stotts Mills, Era Mills and the Knowles Mills for their courtesies and kindness. I am quite certain that American cotton manufacturers could not improve upon the hospitality I was afforded.

Effect of Hot Water Temperature on Washing Fabrics

A FIVE-YEAR study of soil and stain removal from fabrics has been reported by Dr. Pauline B. Mack of The Pennsylvania State College in a paper before the 1948 American Gas Association convention. That part of the study dealing with hot water temperatures is abstracted here from Dr. Mack's paper in the *AGA Monthly*.

The belief that low temperatures will give good laundering results was shown to be entirely fallacious in these studies. Fig. 1 gives the comparative results in terms of improvement in soil removal efficiency by a synthetic detergent of the type exemplified by Detergent A (using 80F for a 30-minute washing time as a basis of comparison) for oily carbon black soil, for temperatures of 80F, 100F, 120F, 140F, 160F, and 180F, for four washing times, namely—5, 10, 20, and 30 minutes. This chart shows that, for each of the times included in this part of the investigation, soil removal efficiency improved consistently with increases in temperature.

The differences in results at the different temperatures were less marked at the optimum washing time (20 minutes) than at shorter or longer washing times; but even here the differences were sufficiently great to be discernible by the naked eye as well as by delicate light-reflectancy electronic measuring equipment. Fig. 2 shows the same general results for oily carbon black standard soiled fabrics with Detergent D, a built soap.

Fig. 3 shows the temperature series of Detergent A (a built soap) with clay soil at six different washing temperatures and four washing times. The same general trends were shown as for oily soil, with 160F and 180F outstandingly better than lower temperatures at the optimum times of 10 and 20 minutes. Fig. 4 shows the same trends with clay soil laundered with Detergent D.

In general, the temperature series for the detergents shown in Fig. 1 to 4, as well as with the other three detergents for which graphs are not given in this abstract, show that higher temperatures consistently give improved detergency where oily dark-colored soil is concerned, with 180F giving the best and 160F the next best in this respect.

The temperatures reported in this study were those in the washing bath, not at the tank or other sources of the hot water. Temperature losses occur in the line from the source to the washing device, and also from the point of entry in the washer to the actual wetting of the fabrics. The former depends chiefly on the following factors: (1) distance from the source of hot water to the washer; (2) diameter of the water pipe; and (3) composition of the conduit.

Temperature losses occurring from the point of entry in the washer to the wetting of the fabrics depend upon the weight and type of the fabrics and upon whether or not they are wet or dry. Considerably heavier losses occur when hot water comes in contact with wet than with dry fabrics. Hence, except for a pre-treatment of fabrics carrying blood or other albuminous stains, which are made difficultly soluble in high temperature washing, the washing cycle should begin with hot water and with a detergent present. Stained fabrics of the type mentioned above should be treated separately from the regular washing for best over-all efficiency.

With the present heating devices, water at 160F can be secured in laundry washing equipment, and this is a recommended temperature for the detergency operations.

Whereas a time of 10 to 20 minutes in the detergency bath at 160F will give the best practical results (with 180F eliminated because water of this temperature at the source will fall approximately to 160F during transport and entry into the washing device, and because this temperature is not desirable if a bleach-sterilizing agent is to be used), one such bath will not give the best results if it constitutes the sole detergency treatment in the cycle. The time and temperature combination mentioned gives the optimum

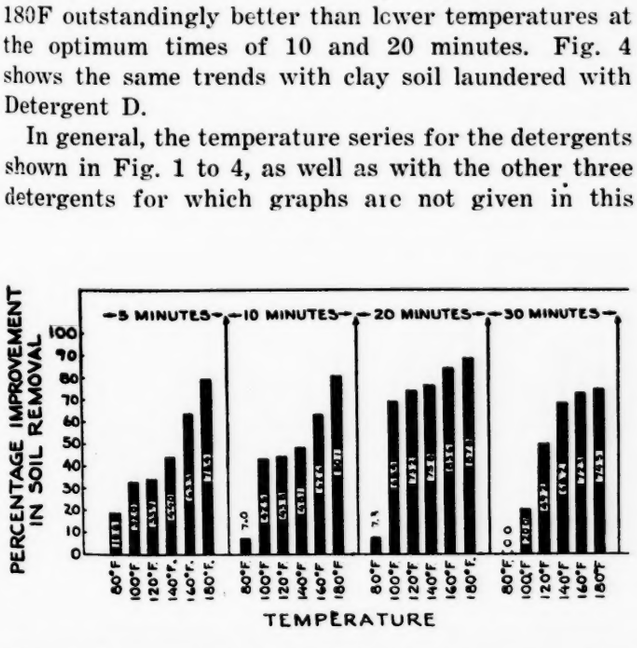


Fig. 1. Relationship of temperature to soil removal improvement, oily carbon black soil, using Detergent A.

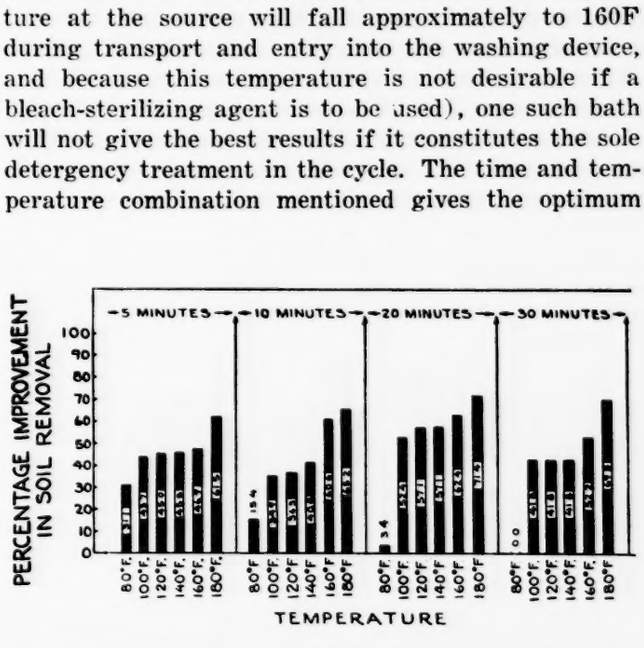


Fig. 2. Relationship of temperature to soil removal improvement, oily carbon black soil, using Detergent D.

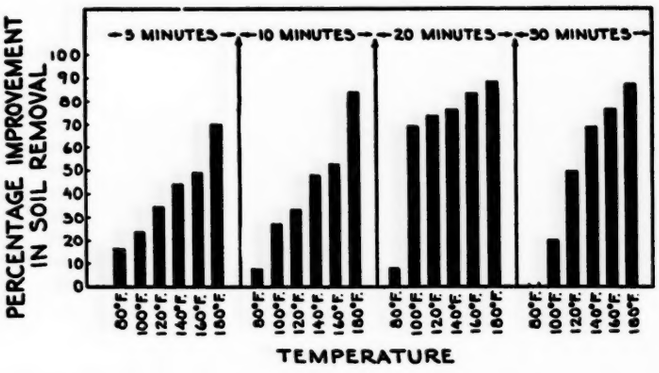


Fig. 3. Relationship of temperature to soil removal improvement, clay soil, using Detergent A.

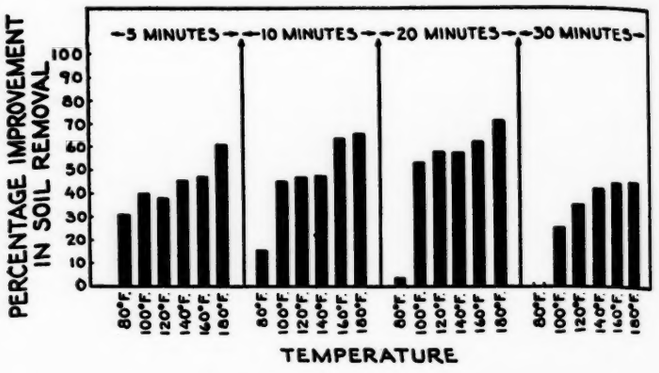


Fig. 4. Relationship of temperature to soil removal improvement, clay soil, using Detergent D.

combination of factors during one continuous washing operation. A new supply of water and a new supply of detergent at the optimum concentration, temperature, and time combinations vastly will improve soil removal and whiteness results.

With the exception of blood and other albuminous stains, the higher the temperature the better the stain removal.

The five-year study was assisted by grants-in-aid by Ruud Manufacturing Co., the Pennsylvania Laundry-owners Association, and the Diaper Service Institute of America.

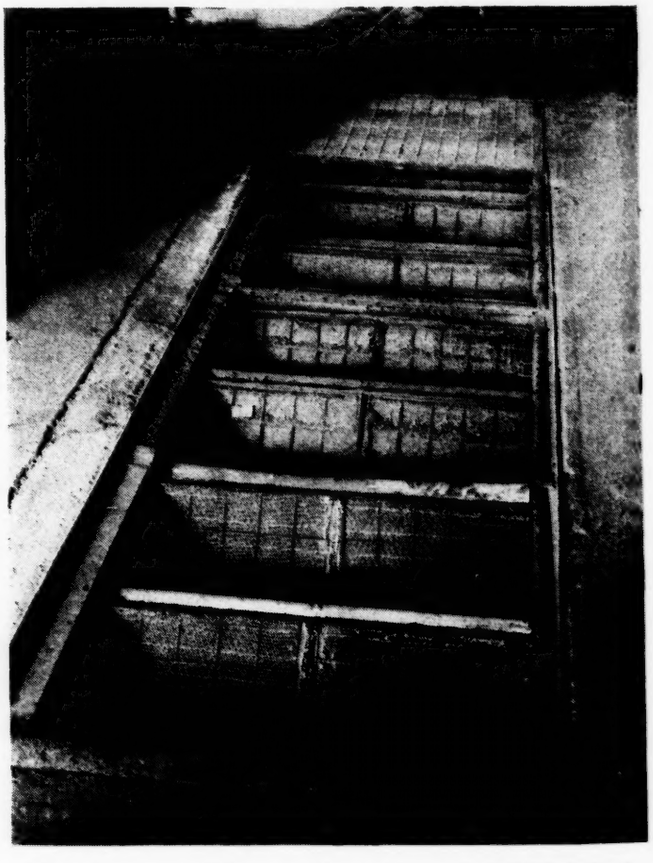
Air Filters Cut Fire and Health Hazards In Spray Painting

Two applications of air filters have been developed for spray-painting operations. One is the use of washable air filters to remove objectionable material from supply air. The other application involves filtering paint out of the exhaust air in paint-spray areas by means of replaceable fiber air filters.

Health regulations governing operations of paint-spray equipment usually specify frequent air changes in the operator's zone. Down-draft exhaust has many advantages for drive-in booths used for painting large objects or vehicles. Air contaminated with injurious fumes and pigments is drawn down through heavy floor grilles away from the operator's breathing zone. Replaceable fiber filters under the grilles prevent exhaust air from depositing entrained paint spray on ducts, blower blades, housings, louvers, and, incidentally, on nearby parked cars and neighboring buildings.

One firm that effectively solved the problem with air filters is Meili-Blumberg, New Holstein, Wis., manufacturers of industrial equipment. After investigating conventional methods of paint removal, Meili-Blumberg engineers decided to try dry fiber replaceable filters with snap-in grids. Vice president Eugene Wulff reports that savings cannot be estimated but states that his firm would use the filter method "even if it cost twice as much as any other system."

In the Meili-Blumberg operation, cross-flow of exhaust air is eliminated by the down-draft system. Removable eight-filter sections containing R-P Self-Seal (Research Products Corp.) filter units are mounted in a pit covered by a heavy-duty grating to support the many-ton loads of Meili-Blumberg equipment. An exhaust fan, connected to the pit by an underground duct, draws air from the paint-spray area down through the grating and filters, into the pit, and finally expels it.



Pit with several floor gratings removed. R-P Self-Seal filter pads in foreground have been replaced.

The installation has been inspected by representatives of the Wisconsin Industrial Commission and by insurance officials who report fire hazard reduction resulting from the filtering equipment. Another advantage is found to be that precleaning of exhaust air contributes to longer life of exhaust equipment.

Air Conditioning Design Conditions for Various Industries

NATHAN N. WOLPERT
Associate Editor, Heating and Ventilating

Part 2 of a group of articles on design conditions considered satisfactory for air conditioned rooms in industry. Data are presented on air control for key processes in many industrial applications.

AN interesting and diversified group of industries has been selected for Part 2 of this set of articles. For each of the industries covered, specific data is given on air conditions to be maintained for key air conditioned rooms or processes. Where it applies, information is also given on the extent to which dust control and bacteriological control are necessary.

Abrasives

In the manufacture of abrasive grinding wheels, an attempt is made to hold the room temperature to 78F and 55% R. H.

Ceramics

Comfort for the worker is the chief cause for temperature control in the ceramic industry, although exact temperature conditions are important where decalcomania are transferred on to whiteware.

In the refractories industry, temperature can range from a comfortable working temperature of about 65F to whatever the maximum summer temperature might be — 95 or 98F. Relative humidity does not have to be controlled for it has no effect upon the product. However, dust control is important and the dust count must be held down to 4 million particles per cubic foot due to the danger of silicosis. Since the material might contain over 9% free silica, the dust content must be controlled.

In the manufacture of whiteware, air temperature is not important in most departments except as it affects the comfort of the men. One of the several spots in the whiteware plant where temperature must be controlled is the decorating shop. Here, where paper is used to transfer patterns from a machine or decalcomania onto ware, reasonable temperature and humidity controls must be exercised. Otherwise the paper will contract or expand to interfere with color registration on the ware. Another critical spot where temperature and humidity control is mandatory is the decalcomania production room. Because temperature and moisture affect the size of the paper backing, it also governs registration of colors.

As silicosis is an industrial possibility, dust must be controlled throughout the potteries, and dust count held down to below 4 million particles per cubic foot. While bacteriological control is not necessary for any of the processes, some of the material used such as lead, barium and zinc compounds have toxic properties and must be properly controlled.

Conditions in the enamel industry are about the same as in the pottery field. Temperature is controlled only for the comfort of the men. Although relative humidity is an important factor in the firing, up to this time no one has done anything to control it. Dust control is necessary because of the inherent danger due to silicosis and because of the possible damage that dirt can do to porcelain enameled steel used in refrigerators and appliances. Much of the air in enamel plants is filtered before it enters the rooms where spraying and particular handling is done.

In glass plants conditions are about the same as in the whiteware plants except that some precautions are taken to control the heat in the machine room where glass bottles and ware are made. Generally this is done by blowers to establish proper air movement in the factory. The dust count must be held down due to the possibility of silicosis.

Plants producing structural clay products operate under the same conditions as refractory plants.

Cigars

Air conditions to be maintained in the manufacture of cigars are listed in Table 6.

TABLE 6—AIR CONDITIONS FOR CIGAR MANUFACTURE

Room or Process	Temperature, F	Relative Humidity, %
Packing and shipping	76	65
Cigar making (machine)	76	73
Tobacco stripping (machine)	75	75
Wrapper tobacco conditioning and storage	75	75
Filler tobacco storage and preparation	78	70
Filler tobacco casing and conditioning	75	75

Cosmetics

Manufacturing throughout the cosmetic industry is done at room temperatures of 65-70F with no humidity control. Often the windows are open to outside air. Although there is some dust control where powders are made, the practice is for the cosmetic companies to buy powders from the few companies that specialize in making them. In most of the cosmetic plants there is no regulation of dust. Bacteriological control is obtained by germicides used in the manufacture and included in the products.

TABLE 7—ELECTRICAL MANUFACTURING

Room or Process	Temperature, F	Relative Humidity, %
Engineering, drafting, and sales	73	40-50
Instruments		
Manufacturing	70 ± 1½	Comfort
Laboratory	70 ± 1½	Comfort
Electronic and X-ray		
Coil winding and high tension transformer winding	72	15
Assembly of tubes	68	40
Refrigeration		
Manufacture of refrigeration valves	75	40
Assembly of refrigerators	75	----
Testing	65 and 82	47 ± 2
Testing refrigeration units in traveling, electrified chain conveyors	65 and 82	47 ± 2
Spray painting	75	----
Thermostat assembly and calibration	76 ± 1½	Comfort
Multiplying and wrapping cotton and glass yarns on copper conductors	75	65-70
Small mechanisms—assembly to close tolerances	72	40-45
Assembly of lightning-arresters	68	20-40
Thermal circuit breaker — assembly and test	76 ± ½	30-60
Lapping of thrust runners for vertical water wheel generators	70	Under 50
Meters—assembling and testing	74-76	60-63
Switchgear		
Winding of capacitor sections, storage of paper, assembly of fuses and cutouts	73	50
Rectifiers—processing selenium and copper oxide plates	74 ± 2	30-40

Electrical Manufacturing

A large number of products and processes are covered by the generic term electrical manufacturing. It includes not only coil winding, machine operations, assembling and testing, but a certain amount of laboratory work where specified conditions must be maintained.

In the room where refrigerator units are assembled, filtered air is supplied under positive pressure to keep out dirt from adjoining areas. Cooling is for comfort purposes only and no attempt is made to hold the relative humidity to any fixed amount. For performance testing of refrigerator units, definite air conditions are maintained. Although the air is filtered, no effort is made to hold the dust count to a special figure. In testing of refrigerator units, temperature and humidity control is employed for the return air.

In assembling lightning-arresters, the air conditioned room is maintained at the lowest possible relative humidity and temperature to reduce the dewpoint.

The room where refrigerator valves are manufactured is held to as low a relative humidity as possible to prevent corrosion of valve steel.

The amount of rejects of coil and high tension transformer windings for electronic work has been definitely reduced as the result of keeping moisture content and dust out of the windings.

Maintenance of constant temperature is a primary consideration to insure uniform calibration of thermal circuit breakers.

Humidity is held down to prevent rusting during the internal assembly of electronic tubes and in the lapping operation listed in Table 7.

Some type of air filter is used for all the rooms or processes listed, but control to some definite dust count is only employed in the assembly and testing of indicating instruments and in the assembly of ignitron and other electronic tubes.

Film Storage and Film Laboratories

Temperature and humidity conditions in motion picture film storage vaults should be such as to insure maximum life for photographic emulsions which, because of their nature, undergo gradual deterioration as they age. Vaults should be cool and dry. Temperatures of 65-70F with a relative humidity of 40-55% meets the storage requirements of most films. While lower temperatures and humidity would be conducive to longer film life, the conditions mentioned are considered satisfactory except for special products for which the manufacturer may recommend other air conditions. These figures are for both raw stock storage and for the storage of developed film. Unless properly stored, developed film may become brittle with long storage so that reuse would not be practical.

By maintaining general laboratory conditions the same as those under which the raw stock is stored, there is no time lag in bringing the film to equilibrium with laboratory conditions before use. However, other factors may influence design conditions. Operator comfort suggests a slightly higher temperature, say 70-75F. It may be necessary to maintain relative humidity at 65-70% to minimize the static which is sometimes encountered in handling film in a too-dry atmosphere. Because of the static electricity problem, a relative humidity below 40% should be avoided.

Laboratory air should be kept as clean as possible. In addition to the treatment in the washing and humidifying chamber, additional cleaning should be provided by electrostatic filters or mechanical filters. The electrostatic type filter is preferred because of its greater efficiency and the small amount of cleaning required of the equipment. Where printing and film processing takes place, glass wool filters should be placed in the air ducts leading to the process rooms, in addition to the regular air cleaning employed. In locations where the intake air is usually quite dirty, it is advisable to install some mechanical type filters in the intake duct.

Another authority recommends that motion picture laboratories and film storage vaults be kept at 70F and 55-65% R. H. He points out that while vault temperature could be lower, it should not go low enough as to cause condensation on the film when it is brought out to an area having normal room conditions.

Leather

For drying heavy leather, such as vegetable-tanned sole leather, the tanned hides are hung in an atmosphere having a temperature of about 70F, with 75% relative humidity. Over a period of ten days or so, these conditions are changed to 90F, with a relative humidity of 35% or less. While these conditions are

not closely controlled and they may vary greatly in different tanneries, a difference of 10 units in these figures would not be surprising. Control largely depends on the judgment of a skilled operator.

Most light leathers, such as chrome-tanned shoe upper leathers, are dried under more closely controlled conditions in a drying tunnel. A typical set-up calls for 120F and 45% R. H.

Leather is sometimes moistened to prepare it for rolling or stretching in manufacturing operations. This is usually done by dipping or spraying with water until the required weight of water is absorbed. Then the leather is allowed to stand in an atmosphere at room temperature or slightly higher and with a relative humidity of 95% for a period long enough to permit the water to become properly distributed throughout the leather. In some shoemaking operations, part of the shoe may be moistened by spraying with steam.

Leather is usually stored in warehouses without temperature or humidity control. However, it is necessary to keep the relative humidity below 85% to avoid mildew. For long time storage, 50-60F and 40-60% R. H. would be considered desirable.

No special control of dust is followed through in the industry.

Until 1948, laboratories for physical testing of leather were maintained at 70F and 65% R. H. These conditions are now being changed to the new standard which is 73.4F and 50% R. H.

Lenses

Fusing in the manufacture of optical lenses is carried out under air conditions of 75F and 45% R. H. Electrostatic filters are used to hold down the dust count.

Linoleum

Precise control of temperatures and humidity is required in the first basic step in the manufacture of linoleum—the mechanical oxidizing of linseed oil which results in the product that forms the linoleum binder. This is a major operation which is conducted in the presence of air that has been conditioned at a temperature of 90-100F and 20-28% R. H. If temperatures during this oxidizing operation were not controlled, the batch would continue to get hotter and hotter until it became unusable. Eventually, it would burst into flame.

For this reason, the rate of flow and temperature of the cooling water in the jacket surrounding the tank is measured at regular intervals. The volume of air used in the process is correspondingly measured.

After the oxidized linseed oil has been cured for several weeks, it is mixed with the cork flour, minerals and color pigments used in making the various types of linoleum.

Stoving processes for the maturing of linoleum involve heated air and are conducted at temperatures between 160-250F. Relative humidity of the air involved is naturally low at these high temperatures. In terms of absolute humidity, moisture content of 60 gr or less per pound of air is desirable.

While bacteriological control is not a factor in manufacturing operations, some operations are stabilized against the possibility of mold growth.

Matches

Generally speaking, air conditioning in match manufacture is used only in the drying of the match heads. In older installations, the entire room was air conditioned but in some of the newer ones, only the individual machine is air conditioned. Drying is speeded by keeping the relative humidity low, about 40%, and the temperature 70-75F.

Munitions

Air conditioning for munitions was recognized during World War I when it was used with good results in the manufacture of time ring fuses. It is important in permitting close gage tolerances and in holding down the moisture content of the explosive charge. Air conditioning is also important in holding down moisture condensation on ceilings, walls and windows during the winter months.

Because of the danger of explosive dusts carrying a fire from one room to another, usually duct work is not allowed to pass from one explosive room to another, regardless of whether or not outlets are taken off in each room.

Filters in return air ducts can become exceedingly hazardous when powder accumulates on them. The amount of explosive pick-up varies and there is the chance of human error in deciding how often to clean the filter and in judging the amount of powder present.

In rooms where powders are pressed, air distribution must be uniform and very accurately controlled so as to disturb the powders as little as possible. Since the type of items manufactured in air conditioned rooms may change frequently, it is important that the air distribution system be flexible enough to take care of such changing conditions.

Table 8 lists some of the air conditions that must be maintained for various rooms.

The metal parts of percussion elements are rinsed in clear water, after washing, and dried by air at 180-200F. It is important that the paint in the flash holes of an artillery primer dries from the inside out without shrinking. In the first section of the drier, air is maintained at 110F; when the solvents have been removed from the paint, 90F air is blown over the paint surface.

In drying black powder for artillery primers, moisture content is maintained below ¾ of 1% to procure

TABLE 8—AIR CONDITIONS FOR MUNITIONS

Room or Process	Temperature, F	Relative Humidity, %
Metal percussion elements		
Drying parts	180-200	....
Drying paint	110	....
Black powder—drying	120-130	....
Powder type fuse		
Conditioning powder	70	40
Powder loading	70	40
Pelleting room for tracer loading	80	35-40

uniform burning of the powder. Black powder is very dusty and is very sensitive to friction. Therefore, it is necessary to supply 100% fresh outside air.

Two types of fuses are used for projectiles (1) mechanical, which, similiar to a watch, requires close mechanical tolerances, and requires air conditioned air in its manufacture to hold down perspiration of the operators and (2) powder train type, the powder for which must be accurately controlled. Relative humidity is held to within 1% so that the powder moisture content can be controlled to within 0.1% moisture content by weight. More moisture gives a slower timing.

Photographic Film and Paper

Air control is most important in the manufacture of photographic film and paper. Steps are taken to provide dust-free conditions and to prevent the development of microscopic growths. Air conditions maintained in the various rooms are given in Table 9.

TABLE 9—AIR CONDITIONS IN PHOTOGRAPHIC FILM AND PAPER MANUFACTURE

Room or Process	Temperature, F	Relative Humidity, %
Drying	20-125	40-80
Cutting and packing	65-75	40-70
Film base and paper storage	70-75	40-65
Coated paper and film storage	70-75	40-65

All air is washed with water sprays to which an algae inhibitor is added. Air is filtered through glass wool, air mat paper, or electrostatic filters. All make-up air is filtered through Reed filters. Make-up air that is used for film drying is passed through activated carbon filters to absorb any harmful fumes that may be present in the air.

Plywood

Building up the laminations for plywood may be done by cold pressing or hot pressing. For cold pressing, the air should be maintained at 90F and 15-25% R. H. For hot pressing with resin film, it should be 90F and 60% R. H.

Printing Plants

Difficulties experienced in printing establishments operating under normal conditions are because materials used are hygroscopic and that certain printing machines will not operate well under some conditions.

The exact air conditions that are employed are not as important as the consistency with which such conditions are maintained. Whatever conditions are selected must be maintained both during winter and summer. While a lower temperature and relative humidity would be more economical in winter, such values would be more difficult to maintain in summer. Where winter temperature is so low that excessive sweating may occur at 40% R. H., double glass windows or glass block windows have proven effective. One engineer selected 77F and 50% R. H. as the best year-round condition. Another printing authority suggests 80F and 50% R. H. as the conditions to be maintained when it is 90F outside.

Not only is it important to have correct consistent conditions so that accurate registration may result in color printing, but controlled conditions help wood-mounted engravings to be at their correct printing height at all times.

Air humidification in winter is best achieved by spray type air washers; silica gel for dehumidification.

For multi-color printing, air should be at 82F and 45% R. H. For photo-gravure printing, it should be 72F and 50% R. H.

Rayon Manufacture

Although it is possible to produce rayon from many substances, wood pulp and cotton are used almost exclusively because they have the purest cellulose in the most readily available state. Raw material in the form of sheets is dipped in a caustic soda solution. At the end of the steeping operation, the sheets are broken up into a fine matted crumb. These operations are carried on in a room maintained at 70F and 55% R. H. The humidity is held down to prevent condensation on cold pipes and jackets.

The crumb is dumped into tanks for ageing. Although this room is maintained at 73F, it is not necessary to control the humidity.

In the churn room, the sodium cellulose is converted to cellulose xanthate. Temperatures are maintained at 75-80F, and since the cellulose is not exposed to the air, humidity control is not important. During summer, room temperatures are held below 85F.

After ripening, the viscose solution is pumped to spinning machines. The many filaments that are produced by fine jets are twisted into thread and collected in a revolving circular box. In the spinning operation, it is desirable to limit the temperature to 90F during the summer and to keep the relative humidity at least 70% or higher. Variations in temperature and humidity may cause crystallization of the solution which in turn results in breakage of the thread. Winter conditions are 75F and 70% R. H.

The centrifugal force of the revolving box in spinning produces an annular cake. This cake is removed from the box and is held in storage until needed for later processing. This storage room is kept at 85F and 100% R. H.

From the storage room, the cake goes through the following processes: first washing, desulfurizing, acidification, bleaching and final washing. Cakes are loaded on skid-type racks and moved into the drying room. After cakes are dried, they are left in the dryer under controlled conditions of 100F and 65% R. H., to bring the rayon back to the proper regain.

The final operation takes place in the coning room where winding machines place the rayon yarn on cones. As rayon yarn is sold by weight, definite humidity control is needed. Temperature is kept at a maximum of 80F to prevent perspiration from workers' hands from soiling the yarn, and relative humidity is kept at 55% so that the yarn will have the legal moisture.

(To be continued)

Selection and Location of Unit Heaters in Factory Buildings

M. J. WILLIAMS
Engineer, The Trane Company

ONE of the most flexible heating systems for factory and industrial type buildings is the propeller type unit heater system. Unit heaters have become popular in the past two decades. They are inexpensive, easy to install and service, and, when properly selected and installed, they do a good heating job at low operating cost.

In order to get that good heating job it is first necessary to select the proper type unit. Once that is accomplished, the next most important part of the job is the proper location of the heaters. Supporting these essentials are the following factors that should be given careful consideration:

(1) Select units with:
  (a) Sufficient capacity,
  (b) High operating efficiency,
  (c) Quiet operating fans and motors.
(2) Locate the units to give:
  (a) Distribution of heat in accordance with the calculated heat losses,
  (b) The best heat distribution to promote employee efficiency.
(3) Locate the units in accordance with the mounting heights recommended by the unit manufacturers.

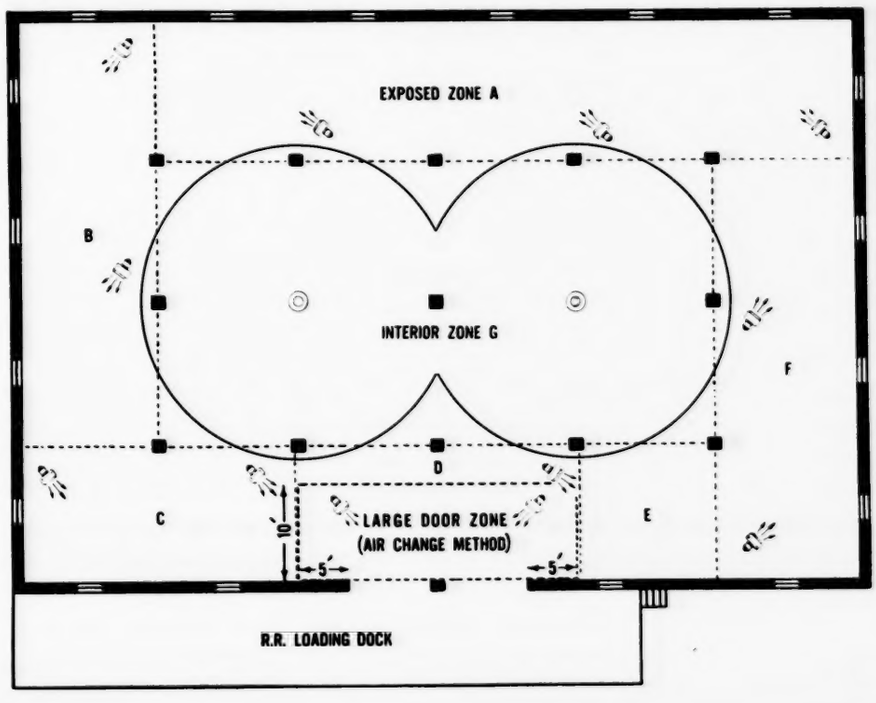
There are countless guideposts in selection and location of heaters that are peculiar to industrial and factory type buildings. For example: when dealing with manufacturing plants, care must be exercised in locating the units and piping. Neither should interfere with the operation of overhead doors, swinging doors, traveling cranes and the general transportation or assembly of the manufactured products.

In many instances, cold drafts or hot blasts of air are objectionable both to employees and good production technique. But in some types of manufacturing, pronounced air movement is of no serious consequence, provided the air currents coming in direct contact with the employees are not too warm or too cold. Such objectionable conditions may be avoided by delivering high enough final temperatures to prevent a drafty feeling, and by the use of outlet diffusers and deflectors to dissipate hot blasts when units are placed close to room occupants.

Although better diffusion and more even temperatures can be maintained in a heated space when the rate of air recirculation through the heaters is relatively high, this fact is generally secondary, in factory and industrial applications, to provision of sufficient heat distributed in proportion to heat losses. Units selected on that basis usually will recirculate the air from three to four times per hour and oftener in localities where the outdoor design temperature is very low.

In buildings with high ceilings and where units are located 8 to 10 ft above the floor the air turnover should not be determined on the basis of the entire room volume, but upon the assumption that the units will circulate the air to a greater extent in the lower portion of the space. The room height used for calculating air recirculation may be taken at approximately 5 to 6 ft above the top of the unit heater.

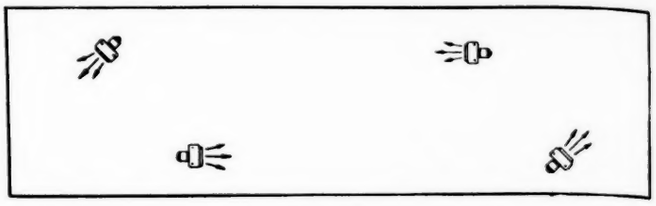
Of course, under these conditions, a portion of the heat delivered by the unit will be lost to the ceiling by stratification. This heat loss decreases as the rate of air turnover increases in the room. In buildings with high ceilings where the ceiling temperature, due



Typical arrangement of exposed and interior zones for figuring heat losses. Also illustrated is the air change method of blanketing large doors. Cubage for figuring this method should be determined by the dimensions shown plus a height dimension of the door plus 5-ft. The general practice is to figure 30 air changes per hour for this cubage. Note: This air change method handles the blanketing of the doors when open. For proper heating with doors closed, Zone D should include the full area to the outside walls and doors. A wiping action is secured by the heaters serving the exposed zones. Small projection units in the interior zone handle the ceiling heat loss while two door-controlled units blanket the large loading doors when open.

to this stratification, becomes quite high, vertical discharge units may be located near the ceiling for the purpose of picking up this hot air and discharging it down to the working zone. These ceiling mounted units should be controlled by a thermostat located in the high point of the building to operate the fan only and recirculate the otherwise wasted warm air, and a thermostat at the breathing level to control the steam supply at the unit.

In order properly to distribute the heat where it is needed, it is a good idea to divide the space to be heated into sections according to the probable maximum and minimum heat losses. For example, consider industrial buildings with large floor areas. A great part of the building is considered as an inside zone where only ceiling losses occur. In this inside zone or area, the heat losses would be less per square foot of floor area than the zones near the outside walls. For this reason the outside bays should be calculated separately from the inside, and the heat distributed in accordance with the heat losses.

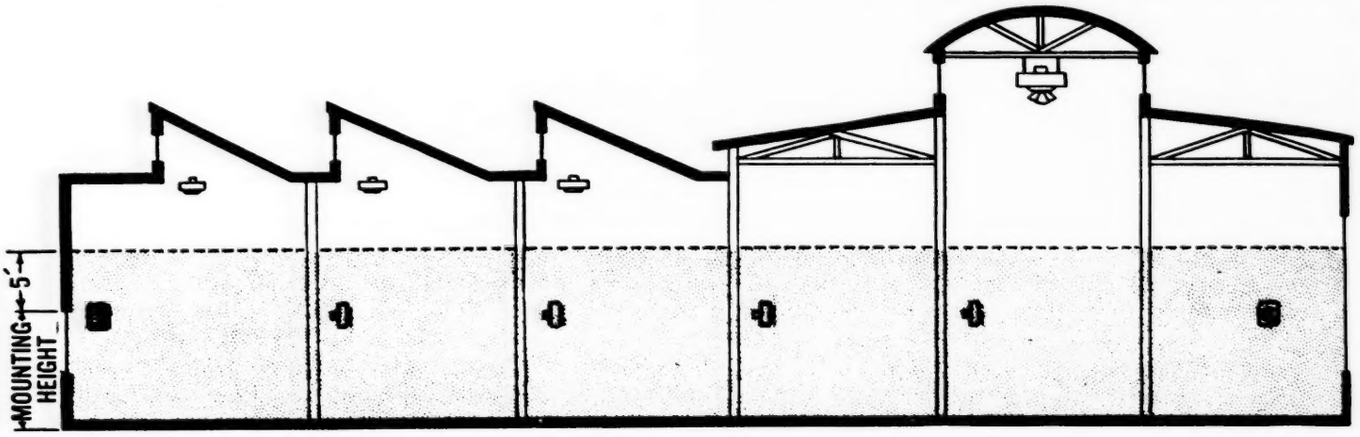


In a long narrow factory building exposed on all four sides, horizontal type unit heaters may be located in this manner to give a wiping effect along the walls.

direction around the outside walls of the building to give a "wiping" effect.

The vertical discharge type unit heaters should be selected with care, taking into consideration the mounting height and the final temperature of the discharge air.

In offices, cutting rooms in garment factories, and in other locations where ceilings are relatively low and hot blasts would be objectionable, vertical discharge unit heaters should be provided with diffusers that break up the air currents and eliminate direct



When units are mounted 8 to 10 ft above the floor, the volume for figuring should be based on a ceiling height approximately 5 ft above the units. Vertical discharge units at the ceiling discharge stratified warm air down to the working level. These units will often require little or no steam.

Large outside doors that are likely to remain open for extended periods, such as loading dock doors, should be blanketed with a stream of warm air to prevent floor drafts. The units used for blanketing these openings may be operated by means of a door switch. Either units with a horizontal or vertical air discharge may be used. Such units should be equipped with two-row coils so the final temperature of the air will be sufficiently high to produce satisfactory results. Where large doors are opened frequently and wind pressure is high, blower type units are often most desirable.

One way of selecting the size of the unit heater for blanketing doors is the air change method. This may be based on approximately 30 air changes per hour on the basis of a cubage determined by the following dimensions: 10 ft in from the outside wall; width of door plus 10 ft; and a height equal to the height of the door plus 5 ft.

Horizontal discharge unit heaters should be located so the air streams from the units blanket the outside walls. It is not the best practice to have the units discharge directly toward an outside wall, but at an angle. For best results, the units should be located to produce an air stream moving in the same general discharge of high velocity heated air upon workers.

In a factory doing assembly work where the parts may be machined at one end and assembled into the finished product at the other end, relatively even temperature distribution should be maintained. In this instance, it is important to select smaller units and place them comparatively close together.

In some buildings heat is required only in certain areas. One example is a sawmill where one or two employees are stationed at certain points throughout the plant. As heat is required only at these points it would be uneconomical to heat the entire plant just to provide comfort for these few men. Unit heaters may be used to provide spot heating of these particular areas. The units in this case would be required to operate continuously while the men are at work.

Plan the heating system along with the rest of the building to get a satisfactory job. Following the suggestions outlined here should help you to get a better unit heater heating system. Also, when you encounter difficulties in selecting and locating units, remember that most reliable manufacturers have competent personnel in the field to make recommendations and guide you in problems peculiar to your own installation.

Proposed Research in Transportation of Perishable Products

ARTHUR W. TURNER[1]

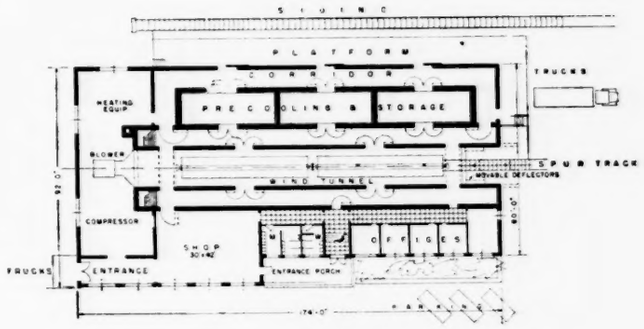
IN the field of agricultural products transportation, agricultural engineers of the U. S. Department of Agriculture recently have proposed the construction and development by the Department of Agriculture and cooperating organizations of a new research facility—a special laboratory for investigations in controlled rail transport of perishable farm products. Work carried on in this laboratory would be cooperative with horticulturists, poultry husbandrymen, animal scientists, meat and meat products specialists, and others.

In making this proposal, it is the engineers' premise that lack of facilities for controlled research in rail transportation of perishable products tends to hold back progress in this field. As a result losses occur that are costly to the nation as a whole, to producers and consumers, and to the transportation industry.

The growers of fresh fruits and vegetables in the Imperial Valley of California, for example, have excellent facilities for grading and cooling their crops, and refrigerated warehouse facilities are available at shipping points. Similar refrigerated storages await the commodities at terminal markets. Retail stores and homes also have adequate equipment, though the units are much smaller, for keeping the commodities in proper temperature and humidity conditions until utilized. Some forms of transportation, such as motor trucks and ships, have facilities for controlled cooling or refrigeration, and for heating when conditions require it.

What about rail transportation? Am I correct in stating that on long hauls, during which the maintenance of proper storage conditions may be very critical to quality of fruits and vegetables, regulation of temperature during warm weather is done with manual controls and within the limitations of ice refrigeration? I am not unmindful of the improvements that have been made in railway refrigerator cars. There have been many of them starting with box cars with double sides, roof, and floors, and with room for ice in 1857, to the refrigerated cars of 1949, that have such features as air circulating fans, half-stage icing grates, side-wall flues, diagonal floor racks, long travel springs, and thicker and more efficient insulation as well as other improvements. In most instances, however, these have been limited to making ice refrigeration more efficient.

Many people are already familiar with the present method of research. Newly designed or converted refrigerator cars operate on test runs, many of them



Plan of proposed refrigerator car laboratory

with desired features. In some cases six or more cars, varying in construction or equipment, are in the same train. All conditions are recorded by the accompanying test crew. Results of the tests are based primarily on the weather encountered during the run and how ice retains its cooling effect. In winter, the tests have to do with the functioning of various heating units, and again the weather encountered in the test run is an important and variable factor, in fact, a test involving considerable time and expense may be a failure due to a sudden change in weather along the route.

In a way such research is based on trial and error, as it is impossible to predict or repeat the exact conditions under which a particular test is run. It is impossible, for example, to revise or alter the equipment and make another run under exactly the same conditions of weather, and all such tests consume a great deal of time. The fact that over a million carloads of refrigerated goods are transported every year seems to warrant a more closely controlled technique.

Recent transportation tests conducted by the Association of American Railroads in cooperation with the Department have been reported by the AAR under two separate studies: "Moisture Transmission Report" and "Heat Transmission Report." These reports were received by a number of technical and research men and their comments have been made available to us. In studying these comments, the repeated reference to the need for laboratory facilities and tests was noted.

The proposed laboratory, which according to our present thinking would hold two refrigerator cars, would in reality be a wind tunnel. The reason a two-car laboratory is suggested is to provide for air currents between the cars and to enable us to make a direct comparison of cars with different construction, insulation, or refrigeration or heating equipment. It is further suggested that two refrigerator car shells be obtained. This would permit construction, insula-

[1]Assistant Chief in charge of Agricultural Engineering Research, Bureau of Plant Industry, Soils, and Agricultural Engineering, before the American Railway Association Short Course, Purdue University, Lafayette, Indiana, March 14-16, 1949.

tion, ventilation, air circulation, humidity control, and other factors to be studied and developed at will in the cars. It would eliminate transporting new cars for each test and reduce to a minimum the number of cars in research development. Refrigerated storage space will enable various conditioning of car load quantities of commodities before placing in the cars for the tests.

The laboratory would simulate extreme summer desert heat waves as well as moderately warm temperatures for studying cooling requirements, and then duplicate prolonged subzero blizzards, such as those experienced during the last winter in the Plain and Mountain States. Facilities would be included for pre-cooling, either as in warehouses, cooling before car movement and after loading, and cooling in transit, as it is recognized that time—total elapsed time from loading to unloading—is important.

The proposed project would recognize no boundaries as to means of refrigeration or heating. Ice as well as mechanical refrigeration would be studied for cooling; oil, alcohol, and charcoal for heating. Naturally the action phase would have as its objective the further improvement of cooling equipment and practices in cars now in operation. However, the ultimate would be to develop the most effective and overall economical methods to insure controlled temperature storage for perishable commodities while in transit. If mechanical or other means should surpass ice for cooling, and other methods of heating proved better than those now used certainly the results should be made available. Recent developments show that one system, which is reversible so that it will provide both cooling and heating may be practical.

Based on refrigeration and heating of perishable commodities in stationary storages, agricultural engineers believe better equipment for handling these products in transit can be devised. The scientists advise the following temperatures for various products: Frozen foods, 15F or lower; fresh meat, 30F to 35F; apples 31F to 32F; oranges, 36F to 40F; bananas, 55F; potatoes, 50F; sweet potatoes, 55F. It is doubtful if these temperatures can be assured during transit with present facilities. Humidity requirements for maturity or ripening of a commodity, such as tomatoes, during transit from producing areas to eastern markets, also vary.

In summary, the desired features in controlled environmental storage shipments are:

(1) Flexibility of temperature in each individual car by thermostat control for each commodity.
(2) Cooling or heating by the same unit—without equipment change.
(3) Elimination of heavy and variable weight for refrigerants.
(4) Elimination of all manual controls enroute.
(5) Reduction in transit stops to those needed only for mechanical inspection.
(6) Elimination of odors and gases from temperature cooling and heating units.
(7) Assured temperature control for all types of packaging and car loading.
(8) Elimination of pre-cooling or pre-heating facilities.
(9) Elimination of corrosive effects on the transportation unit resulting from temperature control facilities.
(10) Reduction in losses and claims on commodities.

The laboratory research technique outlined is new only in the transportation field in which it has not yet been tried. Although the initial investment in the laboratory facility would be considerable, there would be some savings in research instruments and it would accelerate the gathering of dependable results in road tests and eventually provide transportation control of perishable commodities equal to that of stationary storage facilities.

New Temperature Scale

On January 1, 1949, the National Bureau of Standards began using the definitions of the International Temperature Scale of 1948, both in its own research program and in calibrating instruments for other scientific and industrial purposes. The new scale was adopted at Paris, France, by the Ninth General Conference on Weights and Measures in October, 1948, and the official text was approved for publication before the end of the year. This is the first revision of the International Temperature Scale since its adoption 21 years ago.

The experimental difficulties inherent in the measurement of temperature on the thermodynamic scale (an ideal scale based on energy changes in a Carnot cycle) led to the establishment in 1927 of the practical scale known as the International Temperature Scale. This scale is based upon six reproducible equilibrium temperatures, or "fixed points," to which numerical values are assigned, and upon specified interpolation formulas relating temperature to the indications of specified standard temperature-measuring instruments. The scale is designed to conform, as nearly as practicable, to the thermodynamic Celsius scale, as it is now known (The Ninth General Conference decided to abandon the designation "Centigrade" and use "Celsius" instead). At the present time, however, it is possible to obtain values of temperature on the International Temperature Scale more accurately than on any thermodynamic scale.

The six fixed points of the 1948 scale are the boiling point of oxygen (—182.97 C), the freezing and boiling points of water, the boiling point of sulphur (+ 444.60 C), the melting point of silver (+ 960.8 C), and the melting point of gold (+ 1063 C).

The same fixed points, with one slight modification, are specified in the 1948 scale, and the laboratory procedures for obtaining temperatures between fixed points are essentially the same as before.

Higher Court Decisions of 1948

of interest to the heating and ventilating industry

A group of outstanding higher court decisions that reveal important basic law of interest to those in the heating and ventilating fields.

LEO T. PARKER
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DURING 1948 the higher courts rendered many outstanding decisions involving heating and ventilating contractors and companies. We shall briefly review these important and outstanding decisions. Many of these decisions are very briefly explained here, but readers who desire details of any specific lawsuit may refer to the citation and obtain and read the complete decision in any good library. Better clip and file these cases for future reference.

Contractor Breached Duty

It is well established law that where a heating contractor agrees to install a heating system within a certain specified time he is bound to do so, unless he is prevented by the property owner or unavoidable incidents intervene.

Another important point of law is that any contract, note, or other paper is void if procured through fraud or misrepresentation.

For example, in Tyler Furnace Co. v. Thomas, 78 N.E. (2d) 80, it was shown that a property owner signed a contract with the furnace company for the installation of a furnace within five days. The company's salesman represented to the property owner that immediate delivery could be made, and at the time of signing the contract secured the property owner's signature on other papers. One of the provisions of the contract was that $225 was to be paid on completion of the work and the balance to be paid in monthly installments thereafter.

The Tyler Furnace Co. did not install the furnace within five days and the property owner telephoned the company repeatedly requesting installation. At the end of the month the property owner notified the company that he was cancelling the contract. The furnace company then sued the property owner for $225 and presented as evidence to the court a properly signed note for the amount.

During the trial the property owner testified that his signature on the alleged note was genuine, but he never intended to sign a note. He further testified that the company's salesman had held a sheaf of papers in his hand at the time and procured his signature thereto by representing that the papers were part of the job order and papers required by government regulations.

The higher court held that the property owner need not pay the note; first, because the furnace company had breached its contract to install the furnace within five days; and second, the note was signed through misrepresentation. The court said:

"In this case the defendant (property owner) contended that he did not understand that he was signing a note nor did he intend to do so and that he did not read what purported to be a note . . . The court therefore concludes that the defendant had a meritorious defense and that the plaintiff (furnace company) failed to comply with the (five day) time limitation as stipulated in the contract."

Also, see Schupp v. Davey-Tree Expert Co., 1926, 235 Mich. 268. Here a property owner was told by a salesman that what he was signing was merely a memo for the home office but in fact was a contract for 200 hours of labor at $1.80 per hour. Here the court said:

"The fraud worked because plaintiff (property owner) was careless, but this did not render it any less a fraud."

Trade Name Law

It is well established law that no two companies may adopt and use similar names in the same territory. This is so because use of similar trade names will deceive and confuse the public.

For example, in American Oil Co. v. Norkus, 57 Atl. (2d) 868, it was shown that the American Oil Co. has been doing business in Pennsylvania since 1922. It sells motor oil, furnace oil and petroleum products in every state on the Atlantic seaboard and spends large sums in advertising. Since 1945, it has also been servicing oil burners in Philadelphia.

In 1945 the "American Oil Burner Service" began doing business in Philadelphia. The American Oil Co. sued the American Oil Burner Service and asked the court to grant an injunction to stop use of the latter name. The higher court granted the injunction, and said:

"By reason of the similarity of the names 'American Oil Company' and 'American Oil Burner Service' there will be a tendency to deceive an confuse the public mind."

Indorser is Liable

Considerable discussion has arisen from time to time over the legal question: Can a finance company collect from an indorser of notes who was fraudulently induced to sign the notes? The answer is yes, if the agents of the finance company had no knowledge of the fraud.

For example, in Heating Finance Corp. v. Braun, 76 N.E. (2d) 920, it was shown that a person named Braun signed his name on a promissory note given by one White who had purchased heating and plumb-

ing equipment on an installment basis. Later a suit was filed by the Heating Finance Corp. against Braun to collect the money due and which White failed to pay to the company.

Braun defended the suit on the grounds that he was induced to sign the note by fraud. He testified that he was told that his signature was desired for the sole purpose of identification and that he was not making himself liable, as an indorser. Also Braun testified that he was not guaranteeing White's account.

Further testimony showed that agents of the Heating Finance Corp. had no knowledge or information that these statements or representations were made to Braun. Therefore, the higher court held that Braun must pay the amount due the Heating Finance Corp. which had purchased White's contract and note from the seller.

This court explained first, that false statements to an indorser that he will not be held liable does not prove fraud in procuring the indorsement, and the indorser may not rely on such representation; second, a person who signs his name on a promissory note is an indorser as a matter of law unless other written words clearly show that the one who signed the note does not intend to assume responsibility; and third, when a finance company purchases a contract and notes of one who purchased merchandise on credit, the company is not obligated by any verbal statements, guarantees or promises between the buyer, seller or indorser.

Boiler Burst

Considerable discussion has arisen from time to time over the legal question: When is a heating service company liable for damages caused by its repairman? The answer is: When negligence or lack of ordinary care on the part of the repairman caused the damage.

For example, in Burr v. Clark Heating Co., 190 Pac. (2d) 769, one Burr sued the Clark Heating Co. for damage done to his residential heating system, alleged to have been caused by the negligence of the company's employee while making repairs to a part of the heating equipment. The heating system included an automatic coal stoker and a second-hand cast-iron Arco boiler composed of sections put together and bolted with bush nipples. The system was of the closed type which employs a relief valve and an air compression tank to relieve excess water pressure.

The boiler in Burr's home was equipped with several safety devices, including relief valve, a compression tank, an aquastat, and a water pressure gage.

Burr contended and testified that the boiler burst after the company's repairman had built a fire in the furnace and admitted water into the boiler by turning the inlet valve. The testimony showed that the boiler would not have burst if the pressure had been kept within the safe limit of 25 or less on the gage, even though the relief valve were not properly working at the time. The counsel for the Clark Heating Co. argued that Burr was at fault because the relief valve was out of order.

The higher court held that the Clark Heating Co. must pay Burr the cost of installing a new boiler, saying:

"Although Smith (repairman) may have been entitled, at first, to rely upon the assumption that the relief valve was in proper working order, nevertheless, when the black hand on the dial did not go back to, or beyond, 25 and the pressure did not subside after registering 60, he had notice that the relief valve was not working, and that the addition of more water would increase the pressure far beyond the danger point. Under these circumstances, Smith was charged with the duty to exercise at least such care as a reasonably prudent man would exercise under similar circumstances."

Defective Construction

According to a recent higher court, a heating contractor is personally responsible for damage to a building that was caused by negligent installation of a heating system.

For illustration, in Martin v. Westover Court Corp., 42 S. W. (2d) 198, it was shown that a property owner decided to construct 49 homes. Heating units were installed in each of them by a heating contractor who submitted the lowest bid.

A part of the work performed by the contractor was the installation of metal heat ducts through openings made in the brick work of the heating system just above the top, and at the hottest part of the furnace, to take the heat from the heating chamber out into the rooms. These openings naturally had to be slightly larger than the ducts which went through them, and the contractor was required to fill in the openings in the masonry around the metal ducts, after the ducts had been inserted.

Several of the homes were destroyed by fire. In the subsequent suit the property owner contended that the contractor failed to set these hot air ducts upon mortar or non-combustible material, but upon blocks of wood concealed by a thin coating of mortar; that these wood blocks were used as fillers instead of mortar, and that the houses caught fire because of this defective installation. Also, the city Fire Department officials became interested and reached the conclusion that the fires were due to exposed timbers and wooden blocks being placed under hot air ducts.

The higher court indicated that the contractor must pay the property owner the full damages and value of the homes destroyed by fire. This court said:

"A jury should be told that . . . it should allow the defendent (property owner) all damages occasioned by the fires due to unprotected blocks of wood placed under hot air ducts. . . ."

The property owner also asked the court to compel the contractor to tear out all ducts in all houses and replace the wooden blocks with fireproof materials. The higher court refused to do so, saying:

"The one act of negligence consisted of putting blocks of wood under hot air ducts which caused four fires; and for this he (contractor) must pay. For the changes made in the forty-odd houses where there were no fires, it is perfectly plain that the heating contractor is not responsible. . . ."

Obviously, however, if fires occur in other buildings, caused by the impractical wooden blocks, the higher court will hold the contractor liable. Hence, to protect himself against future suits the contractor best had replace the wooden blocks with fire resistant material.

Dealer Burns House

According to a recent higher court a dealer who negligently installs a heating unit in a building, or negligently repairs it, is liable for full damages if the heating unit causes damage to the building.

For example, in Montgomery v. Scharrenbeck, 204 S. W. (2d) 508, the testimony showed facts, as follows: A homeowner purchased a heating unit and used it 16 months when he temporarily disconnected it. Being unable to reconnect the heater the property owner notified the dealer who had sold it to him and previously installed it. The guarantee under which the heater was sold had expired, but the dealer sent a mechanic to reconnect the heater. The mechanic found that the fuel was not flowing properly through the constant-level valve and that some of the valve parts were corroded. So he removed, cleaned and replaced the corroded parts, decided that the fuel was flowing properly, and informed the property owner that the heater was ready to be lighted.

Soon after the property owner lighted the heater the roof caught fire and the flames were whipped by a strong north wind. The house and its contents were destroyed.

The higher court held the dealer liable for value of the destroyed home and furnishings therein, saying:

"The jury determined that those circumstances required Sessions (mechanic) to keep a closer watch on the fire in the burner and to be more careful in regulating the heat as he attempted to repair and adjust the heater and burner."

Cannot Recover Taxes

According to a recent higher court a taxpayer who voluntarily or involuntarily pays his taxes, cannot recover them unless a special statute is enacted which gives him the right to receive back the taxes.

For example, in Weil-McLain Co. v. Collins, 69 N. E. (2d) 487, it was shown that Weil-McLain is in the business of selling at retail plumbing and heating supplies and building material to contractors and subcontractors.

The court was asked to decide whether the company could recover taxes illegally paid under the provisions of the Retailers' Occupation Tax Act.

The higher court held that a taxpayer who has voluntarily or involuntarily paid his taxes, whether legal or otherwise, can recover them *only* under a statute enacted as matter of grace by the state Legislature. Thus, taxes paid cannot ordinarily be recovered from a state, county or city.

Knowledge is Fatal

Modern higher courts consistently hold that knowledge of an unrecorded mortgage or contract makes it valid.

For illustration, in F. M. Sibley Co. v. Gottesman, 22 N. W. (2d) 72, it was shown that the Monica Plumbing and Heating Co. knew that a person named White had purchased a building on which labor and materials had been supplied. Later the heating company filed a mechanic's lien but failed to include in the statement of the suit the name of White.

The higher court held the lien void, since it was not properly recorded in the county recorder's office.

Incorporated Contracts

Considerable discussion has arisen from time to time over the legal question: When is a general contract incorporated into a subcontract? The answer is: If references are in a contract to plans and specifications this indicates an intention to incorporate them generally and they become a part of the contract for all purposes.

For instance, in Holbrook Co. v. Fazio, 191 Pac. (2d) 123, it was shown that a general contractor sublet a "construction subcontract" with Holbrook Co. calling for the installation of certain heating and ventilation work. The contract price was fixed at $20,224. Controversy arose over payments to the subcontractor.

The higher court refused to award payment because the general contract between the owner and the general contractor provided that 10% should be retained and paid only on "the completion and acceptance by the contractor of all work called for by this subcontract."

The court held that the general contract was incorporated into the subcontract by reference in the subcontract to the general contract.

Property Owner's Agent

According to a recent higher court a furnacer employed and paid by a property owner to install new equipment is legal agent of the property owner and the seller is not liable for acts of the furnacer.

For illustration, in McMullen v. Graham, 28 N. W. (2d) 747, the testimony showed facts, as follows: A property owner's daughter went to a store, saw a stoker and talked with the clerk about it. During the conversation that followed the clerk said he was sure the stoker was satisfactory and he thought it would work all right when installed. It was understood that the furnacer was to install the stoker at the property owner's expense.

Several weeks afterward the furnacer looked over the furnace, took some measurements of the stoker, and concluded that it was necessary to have a certain type of switch for a proper installation.

It seems that he failed to get the proper switch from the seller of the stoker. After considerable delay the property owner sued the seller for breach of the sale contract. In holding the seller not liable, the higher court said:

"The furnacer was acting for plaintiff (property owner) when he ordered the desired switch."

Mechanic's Lien

Considerable discussion has arisen from time to time over the legal question: Is a contractor entitled to a mechanic's lien to secure payment on personal

property or chattels, such as a heating system not permanently connected with the real property? The answer is yes.

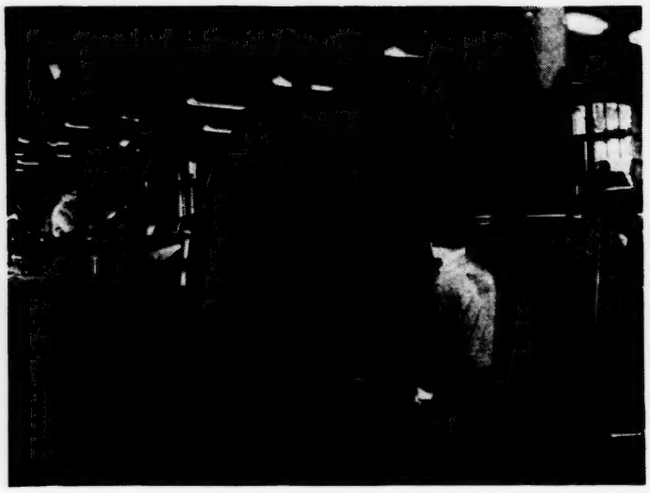
For example, in Floyd v. Rambo, 33 So. (2d) 360, the Sunbeam Heating and Air Conditioning Co. sued on a mechanic's lien. The testimony showed that the contractor had installed a heating system under a contract whereby he retained ownership of the system until paid for by the property owner. The latter contended that the contractor had no mechanic's lien because the lien attached exclusively to the real property.

The higher court held that the contractor had a valid lien, saying:

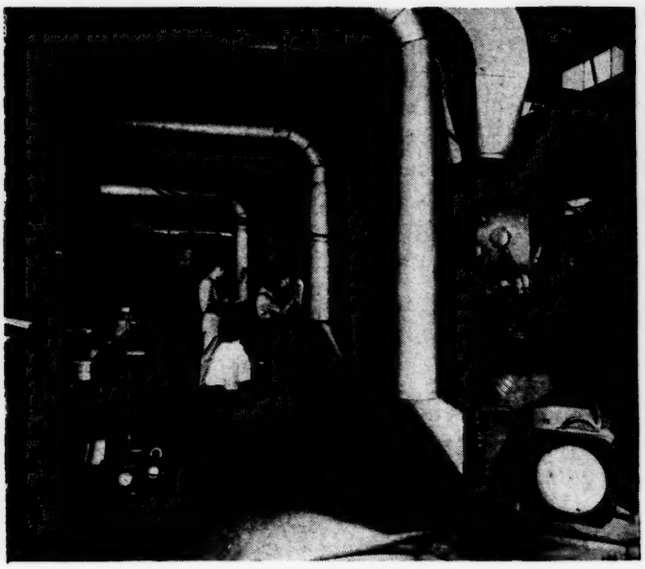
"The great weight of authority is to the effect that the reservation by the contractor of the title to the material and equipment used in the improvement of the real property does not preclude him from asserting a mechanic's lien on the property improved."

For comparison, see Williamsburg Knitting Mill, D.C.E.D.Va., 190 F. 871. Here a contractor installed a sprinkler system and had not recorded his contract. The court held that as between such contractor and a subsequent purchaser of the building, in which the system was installed, the system became a fixture, or part of the building. Hence, since the contractor had not recorded his contract he could not remove the system from the building.

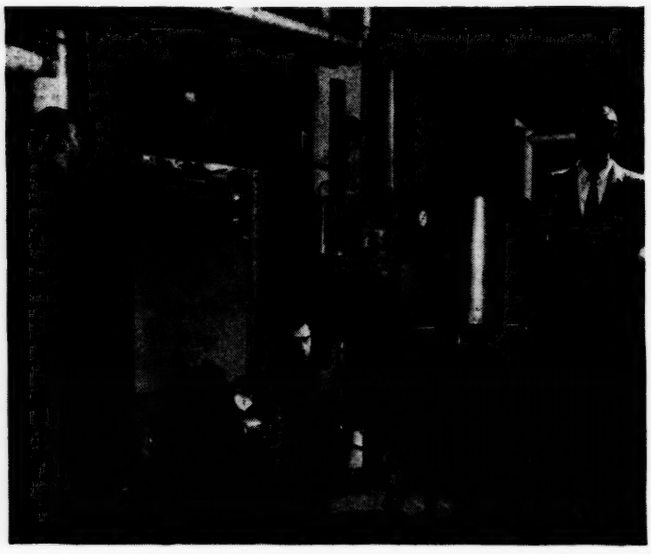
PICTURE PARAGRAPHS



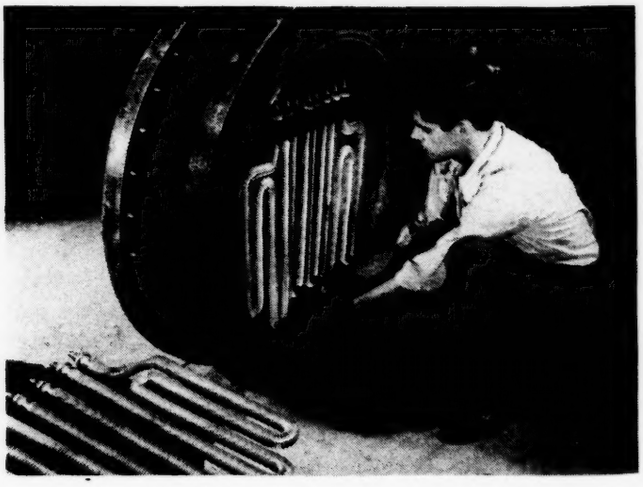
Precision dynamic balancing of such rotating devices as this 8½-ft diameter, 13,500-lb fan wheel and shaft can be accomplished in 1/3 the time required for mechanical balancing, and to tolerances of .000025 inch of linear movement of the floating bearings, with the Dynetric balancing machine used by Westinghouse at Hyde Park, Mass.



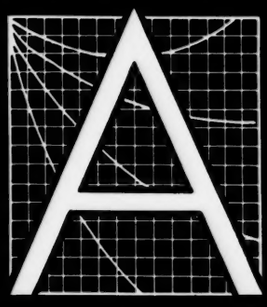
This gas-fired warm air space heater has just completed the equivalent of 14 years of operation during a test at the Heater Research Laboratory of Dravo Corporation. Test ran longer than a year and heater was cycled more than 112,000 times. It is still going.



House heating boilers undergo series of tests in the mechanical engineering department at New York University to determine best operating characteristics under varying conditions of draft, nozzle size and baffling.

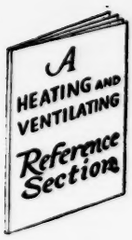


Operator installing 20 G.E. fin-Calrod heaters in one of three cartridges for high pressure air heater designed by Ovens for Industry, Inc., for the National Advisory Committee for Aeronautics. Heater is used to preheat dry compressed air for test purposes from 60F to 400F at a maximum rate of 3½ lb per second.



AIR REQUIREMENTS FOR SUMMER COOLING AS AFFECTED BY HEAT GAIN IN DUCTS

WYMAN K. ENDER and S. KONZO



Air Requirements for Summer Cooling as Affected by

Heat Gain in Ducts

WYMAN K. ENDER
Former Graduate Student in Mechanical Engineering, and
S. KONZO
Professor of Mechanical Engineering, University of Illinois

Four sets of temperature rise curves have been developed as a basis for solving practical problems involving heat gain in ducts used for summer air conditioning. The authors show how to use formulas and graphs in solving design problems.

FOR summer air conditioning, the air volume required for offsetting a given heat gain within a space is dependent upon the temperatures of the air entering and leaving the space. Improper estimates of the temperature of air entering the space may result in inadequate sizes of ducts or in troublesome adjustments of dampers to maintain the required air volumes to different spaces in a given structure. Experimental work dealing with the heat loss from heated ducts to a cooler environment has been reported (1)[1], but that dealing with heat gain from a warm environment to a cooler duct has not been approached. However, the confirmation of the basic relationships for heat transfer from heated ducts to a cooler environment strengthens the belief that the same basic relationships can be applied with confidence to the case of a cool duct surrounded by a warmer environment. On this basis the authors have calculated the probable heat gains of a duct, and have developed four sets of temperature rise curves that can be used in practical applications.

Relationship of Air Volume to Register Temperature

In this discussion the term "register" refers to any outlet in the room which serves to distribute the conditioned air into the space, and hence applies equally well to a common grille, a ceiling type diffuser, a ceiling plaque, slots in an extended plenum, or slots at the window sill. In the design of an air conditioning system, it is assumed that the sensible heat gain for the space to be conditioned is offset by the heat gain of the air circulated through the room. For a given sensible heat gain, the volume of air required is, therefore, dependent on the increase in temperature of the circulated air and the density of the air at the inlet register. These relationships can be briefly expressed by equation (1) which follows:

$$H_s = 60 \times 0.242 \times Q \times \rho_r (t_g - t_r)$$

in which,

H_s = sensible heat gain of the room, in Btu per hr
60 = number of minutes per hr
0.242 = specific heat of air, in Btu per (lb) (F)
Q = volume of air leaving the register and entering the room, cfm
ρ_r = weight density of air at the inlet register, lb per cu ft
t_g = temperature of air leaving the room and entering the return grille, F
t_r = temperature of air leaving the register and entering the room, F

By rearranging the terms in equation 1, the air volume Q can be expressed as:

$$Q = \frac{H_s}{60 \times 0.242 \times \rho_r \ (t_g - t_r)} \quad (2)$$

For any given barometric pressure, the density of the air is dependent only on the register air temperature. If any constant value is selected for the temperature of the air entering the return grille, equation 2 can be simplified and expressed as:

$$Q = C\,H_s \quad (3)$$

in which, C is equal to the reciprocal of the denominator in equation 2.

For summer cooling practice, the average temperature of the air entering the return grille can be considered as being of the order of 78F. Table 1 gives the values of C for various values of $(t_g - t_r)$. The values in the table were based on a barometric pressure of 29.92 inches of mercury and dry air at a temperature of 78F at the return grille. Although the values in the table are specifically for a return grille temperature of 78F, they apply equally well over a range of return grille temperatures between 70F and 85F with not more than a 1.6 per cent deviation.

How to Use Table 1

For any heat gain, the required air volume can be found by the use of the constant C from Table 1. For example, if a room has a calculated sensible heat gain, H_s, of 4,500 Btu per hr, and the air temperatures are 65F for the register air and 75F for the return air, the temperature difference $(t_g - t_r)$ is 75 — 65, or 10F. The corresponding value of C, from Table 1, is 0.0917. The volume of air required is, therefore, 4,500 × 0.0917, or 413 cfm.

[1]Figures in parenthesis refer to references at end of article except where it is apparent they are equation numbers.

TABLE 1—VALUES OF COEFFICIENT C IN EQUATION $Q = C H_s$

Temperature Difference, F: (Return grille temperature) − (Inlet register temperature)	Coefficient C
1	0.932
2	0.465
3	0.310
4	0.232
5	0.185
6	0.154
7	0.132
8	0.115
9	0.102
10	0.0917
11	0.0832
12	0.0761
13	0.0701
14	0.0650
15	0.0605
16	0.0566
17	0.0532
18	0.0501
19	0.0474
20	0.0450
21	0.0427
22	0.0407
23	0.0389
24	0.0372
25	0.0356
26	0.0342
27	0.0329
28	0.0316
29	0.0305
30	0.0294
31	0.0284
32	0.0274
33	0.0266
34	0.0257
35	0.0249
36	0.0242
37	0.0235
38	0.0228
39	0.0222
40	0.0216

Importance of Determining Register Air Temperatures

When a central air conditioning unit is connected by means of a duct system to a number of registers serving different rooms in a structure, the temperature of the air leaving the conditioner is known or can be predetermined. Frequently the assumption will be made that a small temperature rise will occur between the conditioner and the register. In some cases the assumption is also made that the temperature rises will be the same for all of the ducts, and that the air is delivered, therefore, from all of the registers at the same temperature. This method of design is illustrated by Case 1 in Fig. 1. With air leaving the cooling coils at a temperature of 50F, it was assumed that a temperature rise of 5F occurred in each of the ducts leading to rooms *A* and *B*, and that the resulting register air temperatures were 55F for each room. Under these conditions the calculated requirements for air volumes would be 214 cfm for each room.

For a compact system in which the conditioner is located centrally in the structure, and the individual ducts are of equal, or nearly equal length, the assumption that the air would be delivered from all registers at the same temperature would be approximately correct. Under these circumstances, the method of design mentioned can be employed without introducing subsequent difficulties in balancing the system in order to obtain the proper distribution of air to the various rooms.

However, if the ducts are not of the same length, the temperature rises in the various ducts will be different, and so also will be the register air temperatures. This condition is illustrated in Case 2 in Fig. 1, in which the duct to room *A* is short and that to room *B* is long. In this case, owing to the difference in heat gains of the two ducts, the air would enter room *A* at a lower temperature than that of the air entering room *B*. If, after installation, it was found that the air actually entered room *A* at 52F and room *B* at 58F, the corresponding actual air volumes would be 188 cfm for room *A* and 247 cfm for room *B*. These values are in contrast to the 214 cfm predicted by the conditions assumed for the design, and as illustrated by Case 1 in Fig. 1. In the case of room *A*, no great difficulty would be experi-

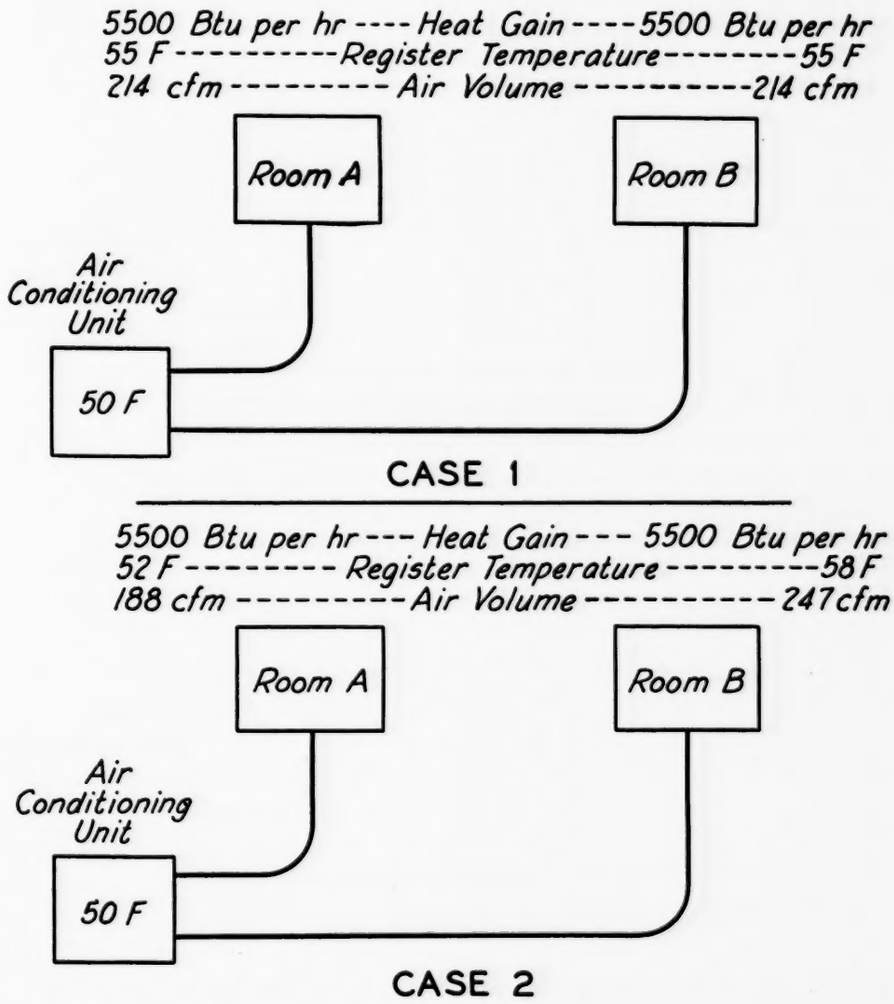

5500 Btu per hr ---- Heat Gain ----5500 Btu per hr
55 F ----------Register Temperature--------55 F
214 cfm --------- Air Volume ----------214 cfm
Room A
Room B
Air Conditioning Unit
50 F
CASE 1
5500 Btu per hr --- Heat Gain --- 5500 Btu per hr
52 F -------- Register Temperature ---------58 F
188 cfm --------- Air Volume ---------- 247 cfm
Room A
Room B
Air Conditioning Unit
50 F
CASE 2

Fig. 1. In Case 1, register air temperatures are assumed to be 55F for both rooms, and the return air, 78F. For Case 2, register air temperatures are not the same for both rooms due to heat gain of ducts.

enced in balancing the system, since the 12 per cent reduction in air volume from 214 cfm to 188 cfm could be accomplished by dampering the duct to room *A* by a small amount.

However, in the case of room *B* the discrepancy between the calculated requirement of 214 cfm and the actual requirement of 247 cfm, or an increase of 15 per cent, could not be as readily compensated as it was in the case of room *A*. An increase in air supply to room *B* could be obtained by increasing the speed of the fan, by dampering the remaining ducts in the system, or by installing a larger duct to room *B*. These difficulties can be largely avoided if accurate information on the temperature rise of the air flowing through ducts is available, so that a reasonable estimate of the expected register air temperature can be made in the original design of the system.

Basic Curves for Temperature Rise in Ducts

A brief discussion is presented in this section of the procedure followed in deriving two sets of general curves, which were later used in setting up the four sets of working curves. Consider first a duct of diameter *D* having a length of 20 ft, as shown in Fig. 2. In this figure:

- w = weight rate of flow, lb per hr
- v = air velocity, feet per second
- t_e = entering air temperature, F
- t_l = leaving air temperature, F
- q_r = heat gained by duct by radiation, Btu per hr
- q_c = heat gained by duct by convection, Btu per hr.

With the ambient air at a temperature higher than that for the air flowing through the duct, the total heat gain, q_t, by the duct from the surroundings will be the sum of the heat gain by convection, q_c, and the heat gain by radiation, q_r. If the heat transfer has attained a steady state, then the heat gain by the duct will be equal to the heat gain by the air flowing through the duct. This relationship can be expressed as:

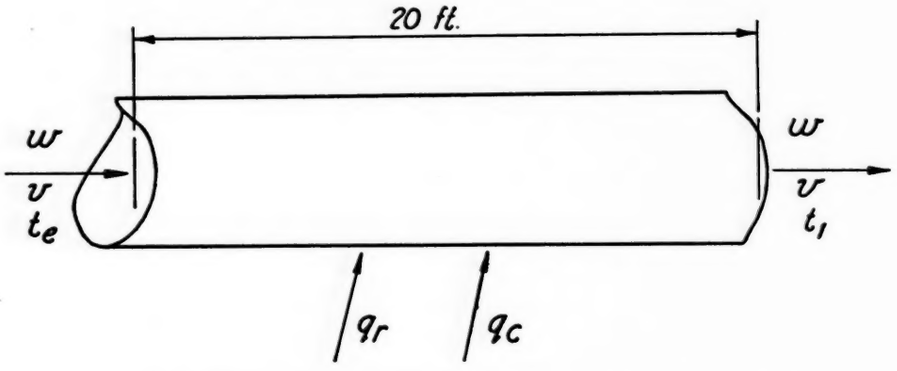


Fig. 2. Diagram of quantities involved in heat transfer to duct.

$$q_c + q_r = w \cdot c \cdot \Delta t \qquad (4)$$

or

$$q_t = w \cdot c \cdot \Delta t \qquad (5)$$

in which,

- q_c = heat gain by duct by free convection, Btu per hr
- q_r = heat gain by duct by radiation, Btu per hr
- q_t = total heat gain by duct, Btu per hr
- w = weight rate flow of air through duct, lb per hr
- c = specific heat of air = 0.242 Btu per (lb) (F)
- Δt = temperature rise of air in 20 ft length of duct, or (leaving air temperature—entering air temperature), F.

Equation 5 can be expressed in the form:

$$\Delta t = \frac{q_t}{w\,c} \qquad (6)$$

By the use of equation 6, the temperature rise in a 20 ft length of duct, considered as a basic length, can be found. The procedure

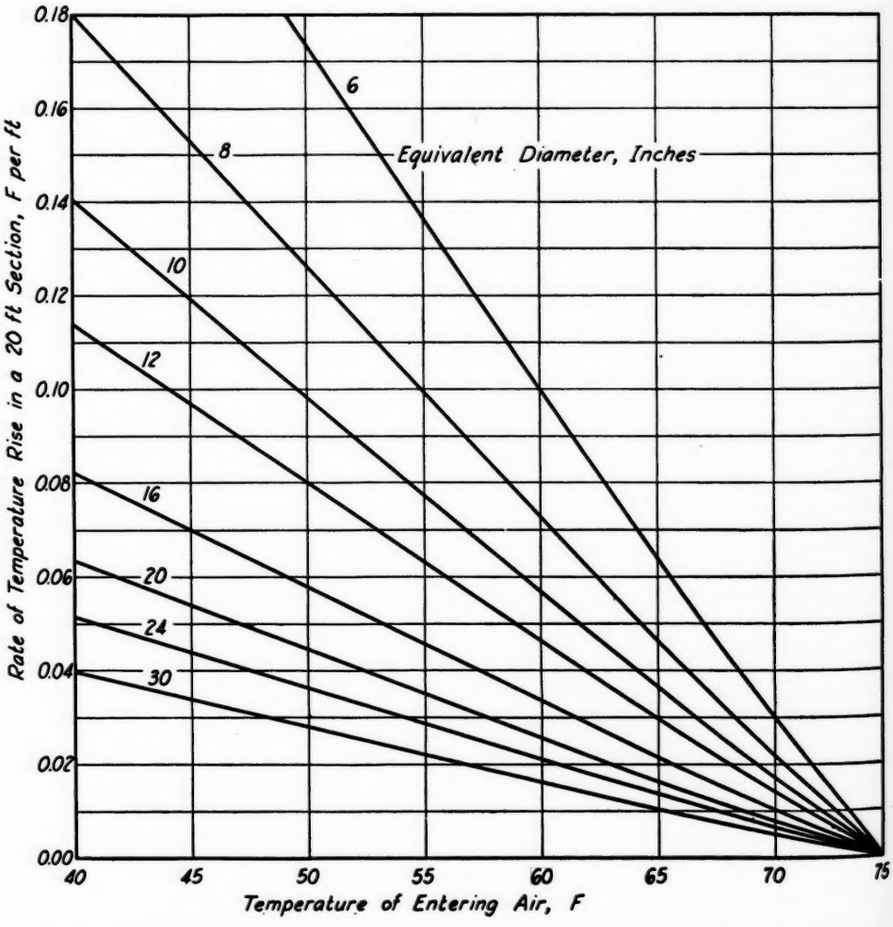


Fig. 3. Rate of temperature rise in galvanized iron ducts as affected by duct diameter. Emissivity coefficient, 0.25; ambient air, 75F; air velocity through uninsulated ducts, 600 fpm.

for the determination of the quantities in equation 6 is outlined in the appendix.

The family of curves in Fig. 3 show the rate of temperature rise in a basic 20 ft section, with air flowing at an average velocity of 600 fpm and with various temperatures of the air entering the duct. This family of curves is expressed in terms of equivalent diameters, which is a characteristic dimension of the cross section of the duct and which is numerically equal to four times the mean hydraulic radius. This latter term is defined as the ratio of the cross-sectional area of the duct to the length of the perimeter. For a round duct the equivalent diameter is numerically equal to the actual diameter; for a square duct the equivalent diameter is numerically equal to the length of the side of the square; and for a rectangular duct having a width, a, and depth, b, the equivalent diameter is then equal to $2\,ab/(a + b)$.

Although Fig. 3 was specifically for 600 fpm, it was found in subsequent calculations that separate curves for other velocities were not necessary, since the curves for any given velocity could be derived from those in Fig. 3 by the use of velocity conversion factors shown in Fig. 4.

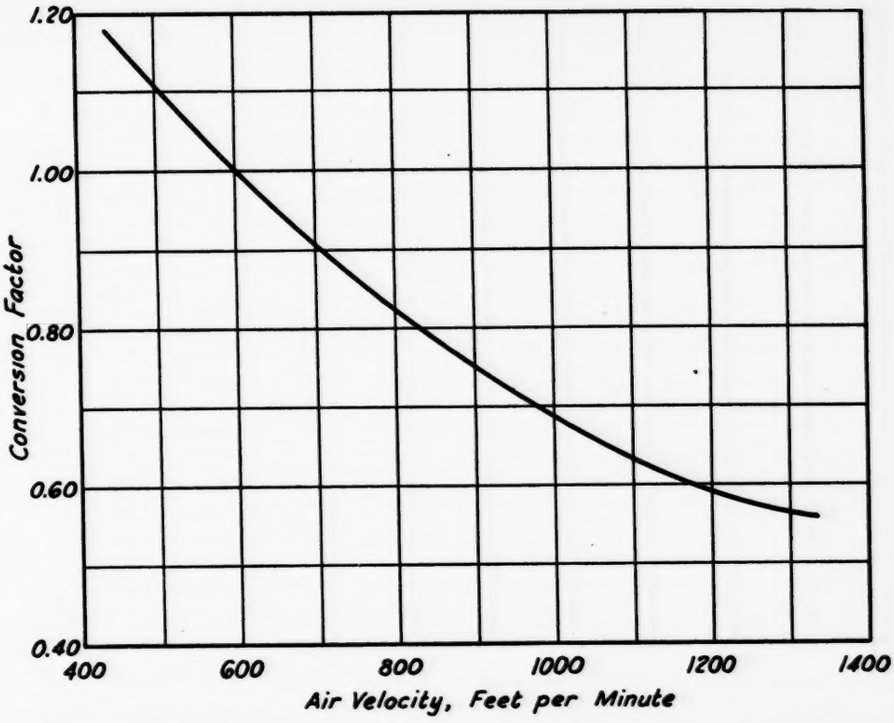


Fig. 4. Effect of air velocity on rate of temperature rise in uninsulated ducts. Emissivity coefficient, 0.25.

Working Curves for Temperature Rise in Ducts

The curves in Fig. 3 are general and can be used to compute the temperature rise in any given length of duct by considering the total length as being made up of a succession of 20 ft sections of duct. For purposes of rapid estimation, four sets of working curves covering the ranges of air velocities, air temperatures, and equivalent duct diameters commonly encountered in air conditioning practice are given in Figs. 5, 6, 7, and 8. In the derivation of these curves from the basic curves given in Figs. 3 and 4, the total length of duct was considered as being composed of a succession of 20 ft sections joined end to end. For a given air velocity and a given equivalent diameter, the temperature rise in the first section, with air entering at 50F, was obtained from the proper curve in Fig. 3. This value was multiplied by the velocity conversion factor obtained from Fig. 4 and by 20, in order to obtain the total temperature rise in 20 ft. By adding this temperature rise to the entering air temperature of 50F, the temperature of the air leaving the first 20 ft of duct and entering the next 20 ft was obtained. Using this as the entering air temperature for the second 20 ft section, the rate of temperature rise in the second section, as well as the temperature at the end of the second section could then be obtained. This procedure was repeated for each successive 20 ft section until the total length of 560 ft was covered.

An entering air temperature of 50F was selected as the starting point in all of these calculations since it was well below the air temperatures normally leaving the conditioner. On the assumption that the temperature of the ambient air adjacent to the duct would be of the order of 75F, the maximum temperature difference of the ambient air and the entering air was 25F. As shown in Figs. 5 to 8, the zero length corresponds to this 25F temperature difference. Furthermore, the temperature differences at the end of successive 20 ft sections were plotted against the distance of the end of the section from the entrance of the duct.

Although the charts in Figs. 5 to 8 were specifically based on an ambient temperature of 75F they can be used for a range of ambient temperatures between 60 and 90F, with less than a 4 per cent deviation from the results corrected to the existing ambient temperature.

Method of Using Working Curves

The use of the charts for estimating the temperature rise can be best illustrated by the following examples:

Example 1. — The temperature rise in a 60 ft length of uninsulated, round, galvanized-iron duct having a diameter of 10-inch is desired. The air enters the duct at a temperature of 55F, the velocity of air flowing is 600 fpm, and the ambient air temperature is 75F.

Solution to Example 1.— The equivalent diameter is the same as the actual diameter of the round duct — 10-inch in this case. From the curve for 10-inch equivalent diameter on the chart for 600 fpm velocity (Fig. 5), it may be observed that an initial temperature difference of 75F — 55F, or 20F, corresponds to a distance of 54.5 ft from the origin. At a distance of

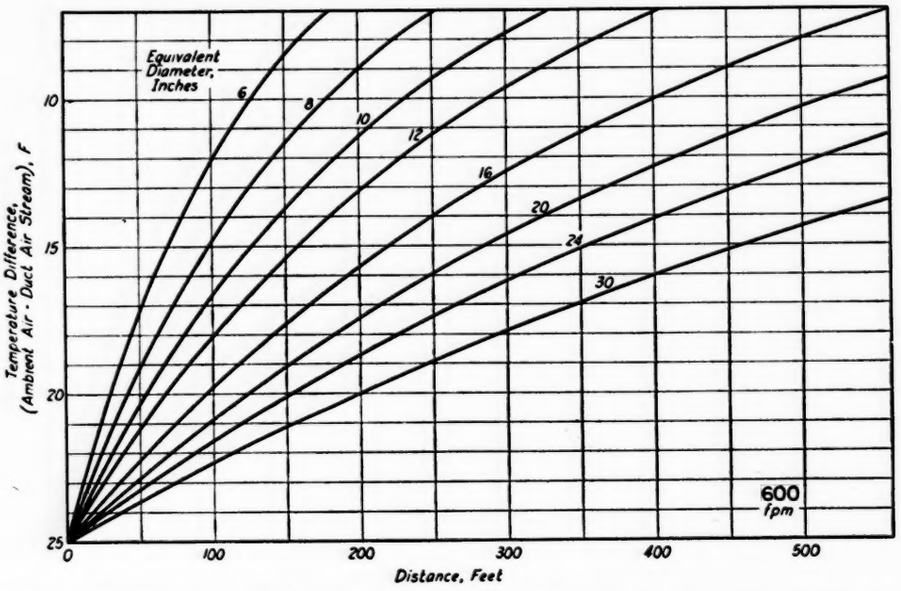


Fig. 5. Temperature rise in ducts for air velocity of 600 fpm through uninsulated ducts. Emissivity coefficient, 0.25.

60 ft further, 54.5 plus 60, or 114.5 ft from the origin, the final temperature difference is approximately 15.7F. The temperature rise is 20 — 15.7, or 4.3F. The final temperature, which is the initial temperature increased by this rise, is 55 plus 4.3, or 59.3F. This register air temperature can then be used in connection with the values in Table 1 to obtain the required air volumes.

Example 2. — It is desired to find the temperature rise in an uninsulated, galvanized-iron, rectangular duct which is 16-inch wide, 8-inch deep, and 60 ft long. Air enters the duct at 48F, the air velocity is 600 fpm, and the ambient air temperature is 72F.

Solution to Example 2. — In this case the equivalent diameter is $(2 \times 8 \times 16)/(8 + 16)$, or 10.7 inches. The temperature rise for this duct can be determined by interpolating between the curves for equivalent diameters of 10-inch and 12-inch on the chart for 600 fpm velocity (Fig. 5). On this chart a temperature difference of 72 — 48, or 24F, corresponds to a distance of about 11 ft from the origin. At a distance of 60 ft further on, or 71 ft from the origin, the temperature difference is about 19.3F. The temperature rise in the 60 ft section of duct in this case is 24 — 19.3, or 4.7F. The final temperature is obtained by adding this temperature rise of 4.7F to the initial temperature of 48F, or 52.7F.

It may be apparent from a study of the ordinates in Figs. 5 to 8 that the charts could be further simplified if fixed values of the ambient air temperature could be selected. For example, the user of the chart could arbitrarily select 75F as representing the average temperature encountered in his applications. In this case, instead of a temperature difference of 25F, the ordinate could be replaced by a new value of 75 — 25, or 50F, corresponding to duct air stream temperature. Since the charts were derived for a more general case in which the ambient air temperature could vary between 60F and 90F, the more complicated ordinate shown in Figs. 5 to 8 was selected. As in the case of the standardized duct design procedure developed for winter forced-air heating systems (2), the basic information shown in Figs. 5 to 8 can be incorporated into a similar standardized design procedure for summer cooling purposes. Some study is being given to this possibility.

APPENDIX

Basic Heat Transfer Equations

Much of the discussion in this section is similar to that covered in greater detail in Bulletin 351 of the University of Illinois Engineering Experiment Station, by A. P. Kratz, S. Konzo, and R. B. Engdahl (1). The condensed summary presented in this Appendix is for the information of the engineer who wishes to determine the validity of the assumptions made in these calculations.

Heat Transfer Through Inside Film

The transfer of heat through the film adhering to the inside surface of the duct occurs by forced convection and can be treated as conduction through a stationary film. From a review of the work of various experi-

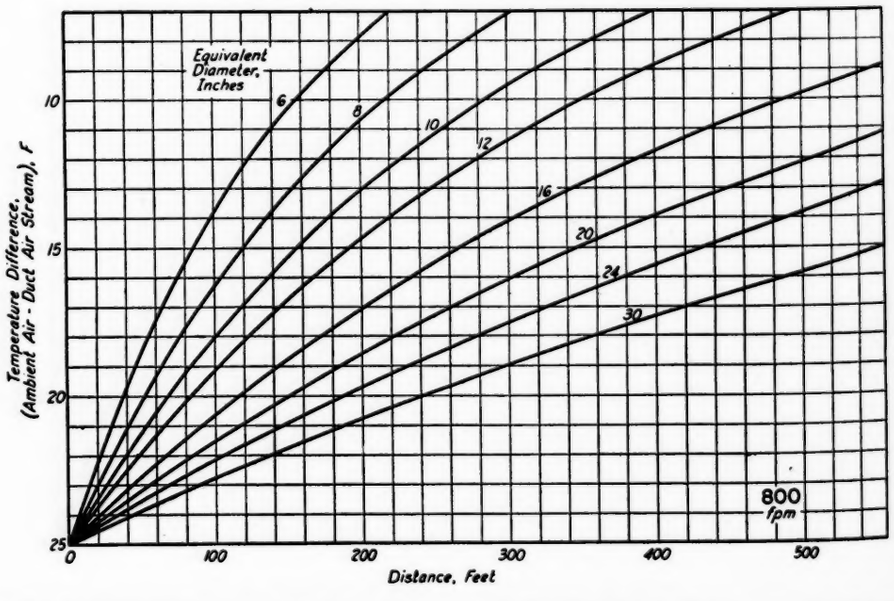


Fig. 6. Temperature rise in ducts for air velocity of 800 fpm through uninsulated ducts. Emissivity coefficient, 0.25.

menters, McAdams (3) (page 169), has concluded that the best correlation of results for the heating or cooling of water, oils, and several other liquids and for gases in turbulent flow in horizontal pipes is shown by equation (7), as follows: $h_i =$

$$0.0225 \frac{k}{D}\left(\frac{D v \rho}{\mu}\right)^{0.8} \times \left(\frac{c \mu}{k}\right)^{0.4}$$

in which,

h_i = coefficient of heat transfer for forced convection, in Btu per (hr) (sq ft) (F)

k = thermal conductivity of the fluid, Btu per (hr) (sq ft) (F per ft)

D = diameter of the fluid stream, ft

v = velocity of the fluid stream, ft per hr

ρ = fluid density, lb per cu ft

μ = absolute viscosity of the fluid, lb per (ft) (hr)

c = specific heat of the fluid at constant pressure, in Btu per (lb) (F)

For calculations applying to a specific gas in a limited temperature range, the Prandtl Number (the quantity $c\mu/k$) may be considered as remaining constant (4). For air over the range of 32F to 212F, Prandtl's number was approximately 0.775 (1). The use of this value in equation 7 resulted in the following modification.

$$h_i = 0.0203 \frac{k}{D}\left(\frac{D v \rho}{\mu}\right)^{0.8} \qquad (8)$$

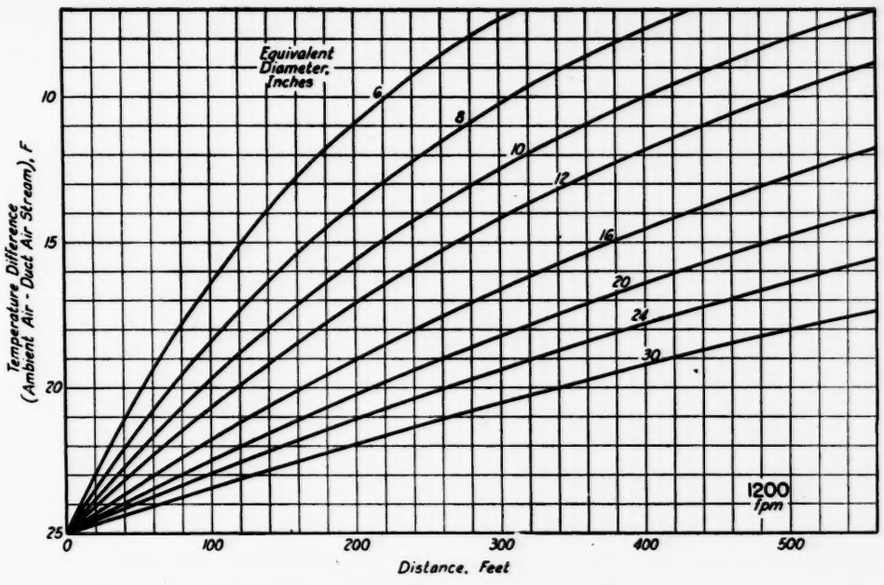


Fig. 8. Temperature rise in ducts for air velocity of 1,200 fpm through uninsulated ducts. Emissivity coefficient, 0.25.

Theoretically, the properties of the fluid in equations 7 and 8 should have been evaluated at the film temperature, but in order to be consistent with McAdams' treatment, they have been evaluated at the temperature of the main air stream.

Heat Transfer Through Outside Surface by Radiation

The transfer of heat from the outside of the duct occurs partly by radiation from the surrounding walls and other objects to the surface of the duct. The heat gain by radiation of a unit area of the duct may be determined by the Stefan-Boltzmann law, equation (9), as follows:

$$H_r = 0.1723\ (10^{-8})\ e\ (T_a^4 - T_w^4)$$

in which,

H_r = heat received by radiation, in Btu per (sq ft) (hr)

e = emissivity coefficient of receiving surface

T_a = temperature of radiating surface, F, absolute

T_w = temperature of receiving surface, F, absolute.

For certain purposes it is convenient to express the heat received by radiation as the product of the area, the temperature difference, and a coefficient designated as the coefficient of radiation heat transfer. This coefficient, h_r, is defined by the equation:

$$h_r = \frac{H_r}{t_a - t_w} \qquad (10)$$

in which,

h_r = coefficient of radiation heat transfer, Btu per (hr) (sq ft) (F)

t_a = ambient temperature, F

t_w = surface temperature, F.

The heat gain of a surface by radiation can be found by use of the following equation:

$$q_r = h_r A\ (t_a - t_w) \qquad (11)$$

in which,

q_r = heat received by radiation, Btu per hr

A = area of receiving surface, sq ft.

Heat Transfer from Outside Surface by Convection

In addition to radiation, heat transfer from the outside surface of a cool

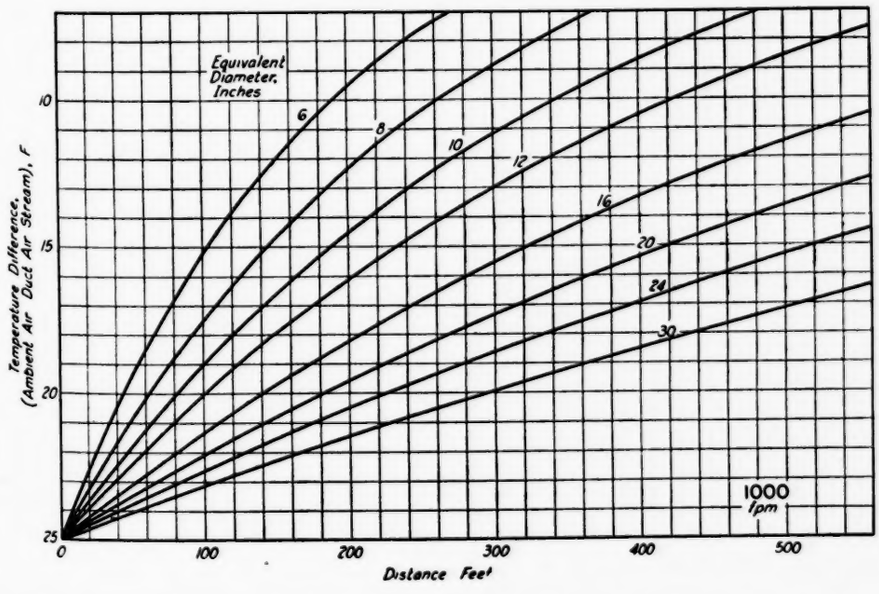


Fig. 7. Temperature rise in ducts for air velocity of 1,000 fpm through uninsulated ducts. Emissivity coefficient, 0.25.

duct occurs by natural convection from the surrounding air to the outside surface film, and then by conduction through the film to the duct. The air in contact with the film contracts as it is cooled, and as a result, air currents are formed within a short distance from the cold surface. For estimation of heat transfer from a single, horizontal pipe (diameter from ½ inch to 2 ft) to air, McAdams (3) (page 249), gives the following equation:

$$\frac{h_c D}{k} = 0.525 \times (\text{Grashof-Prandtl numbers})^{0.25} \qquad (12)$$

in which,

h_c = outer film coefficient of free convection, in Btu per (hr) (sq ft) (F)

Grashof-Prandtl numbers are dimensionless coefficients of a number of variables, including the properties of the fluid. A complete discussion is given in (1). Equation 12 can be expressed in the form:

$$h_c = 0.525 \frac{k}{D} (a D^3 \theta)^{0.25} \qquad (13)$$

in which,

a = a modulus consisting of a number of the properties of air, and which has been evaluated in (3) at a mean temperature between that of the duct wall and the ambient air.

θ = mean temperature difference, F, between ambient air and duct surface.

By establishing h_c, the heat gain of a surface by convection can be found by the use of the equation:

$$q_c = h_c A (t_a - t_w) \qquad (14)$$

in which,

q_c = heat received by convection, in Btu per hr

Heat Balance Inside and Outside of Duct

The calculation of the temperature rises for the range of duct sizes covered by the curves in Fig. 3 was based on the fact that the heat transfer by forced convection through the air film on the inside of the duct was equal to the heat gain of the outside of the duct by both radiation and free convection. The heat transfer through the inside film involved the inside film coefficient, h_i and the gain at the outside of the duct involved the coefficient of heat transfer by free convection, h_c and the coefficient of radiation heat transfer, h_r. From the assumed duct dimensions, the velocity and temperature of the air, and the corresponding physical properties of the air, the coefficients could be evaluated by the use of equations 8, 10, and 13.

For thin-walled, uninsulated iron ducts the resistance of the metal wall to heat flow is so small that the temperature of the inside and outside surfaces may be considered as the same. Under these conditions, the following equation expresses the relation between the temperatures and the coefficients:

$$(h_c + h_r)(t_a - t_w) = h_i (t_w - t_m) \qquad (15)$$

in which,

t_m = mean temperature, F, of air flowing in duct.

Since the temperature of the duct wall is not known, equation 15 was rearranged as follows:

$$t_w = \frac{h_i t_m + t_a (h_c + h_r)}{h_i + h_c + h_r} \qquad (16)$$

The evaluation of both h_c and h_r involves a knowledge of the wall temperature t_w, so that equation 16 cannot be solved directly. A method of trial and error was therefore used. A mean temperature of the fluid, on which to base the calculations, was first selected, and a reasonable wall temperature was assumed. Using these temperatures, the coefficients h_i, h_r, and h_c were evaluated and substituted in equation 16 to give a close approximation of the wall temperature. This process was repeated until two successive values of the wall temperature were approximately the same. After the wall surface temperature was obtained, the heat gain by radiation and convection could be found by the use of equation 11 and 14, and the temperature rise for the 20 ft length of duct could be found by the use of equation 6. The rate of temperature rise which is shown in Fig. 3 was obtained by dividing the results from equation 6 by the duct length of 20 ft.

The temperature rise in a short section of duct is small and is practically a linear function of the distance along the axis. This is not the case in long ducts, and considerable error might result if a mean rate of temperature rise was applied to a duct of any great length. Hence, all of the calculations were based on a section of 20 ft and temperature rises of long ducts were obtained by regarding such ducts as being composed of a succession of 20 ft sections.

Emissivities of galvanized-iron surfaces may vary from 0.14 for bright, new surfaces to about 0.53 for old, dull surfaces. For purposes of computations, a value of 0.25 was selected for the emissivity as being representative of average conditions in service (1).

References

(1) Kratz, A. P., Konzo, S., and Engdahl, R. B., Temperature Drop in Ducts for Forced-Air Heating Systems, *Bulletin 351*, 1944, University of Illinois Experiment Station.

(2) Konzo, S., *Manual 7 for Design of Forced-Air Heating Systems*. National Warm Air Heating and Air Conditioning Systems.

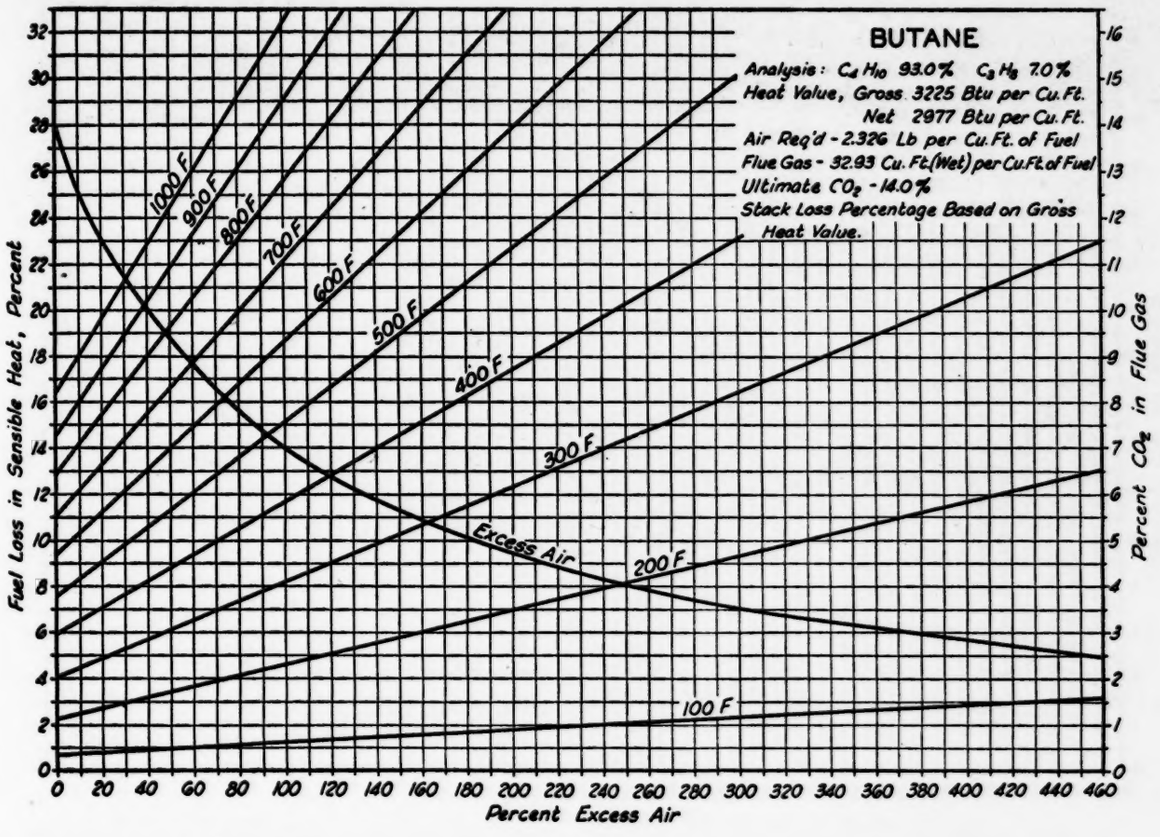
(3) McAdams, W. H., *Heat Transmission*, McGraw-Hill Book Co., Inc., New York, 1933.

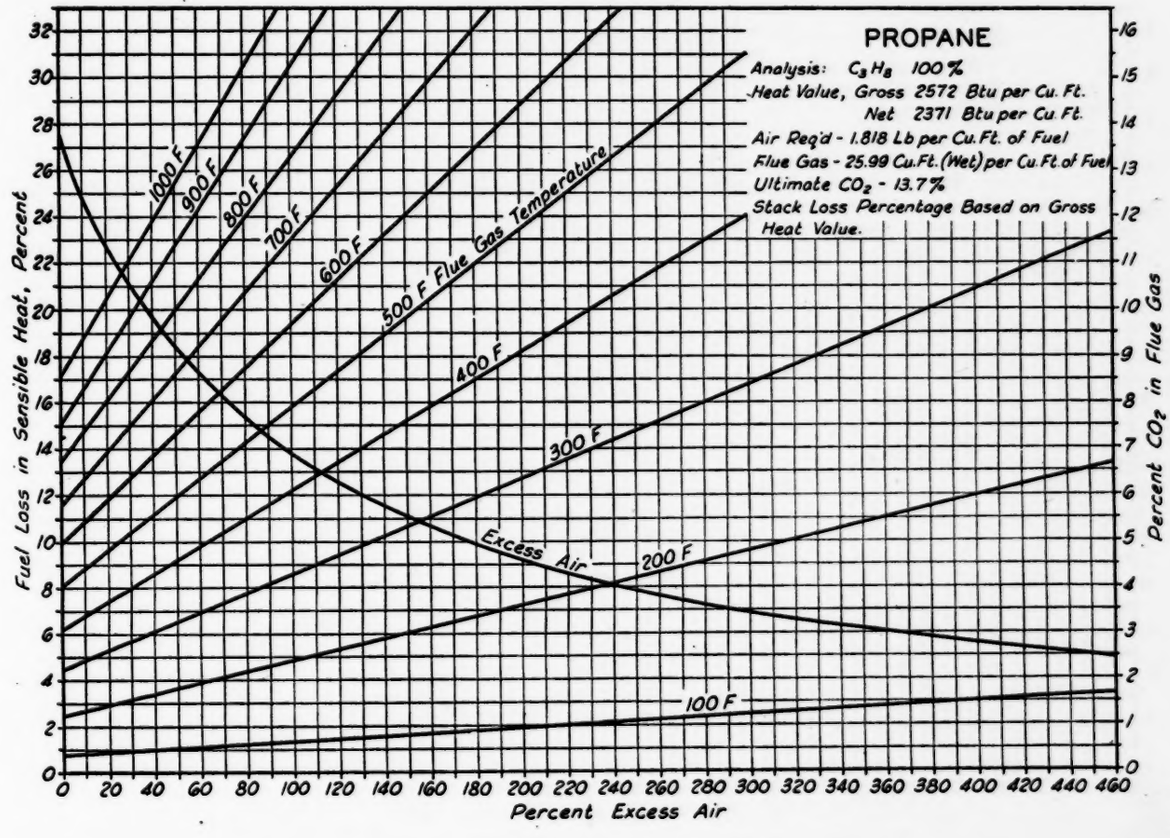
(4) Brown, A. I., and Marco, S. M., *Introduction to Heat Transfer*. McGraw-Hill Book Co., Inc., New York, 1942.

Bind in.

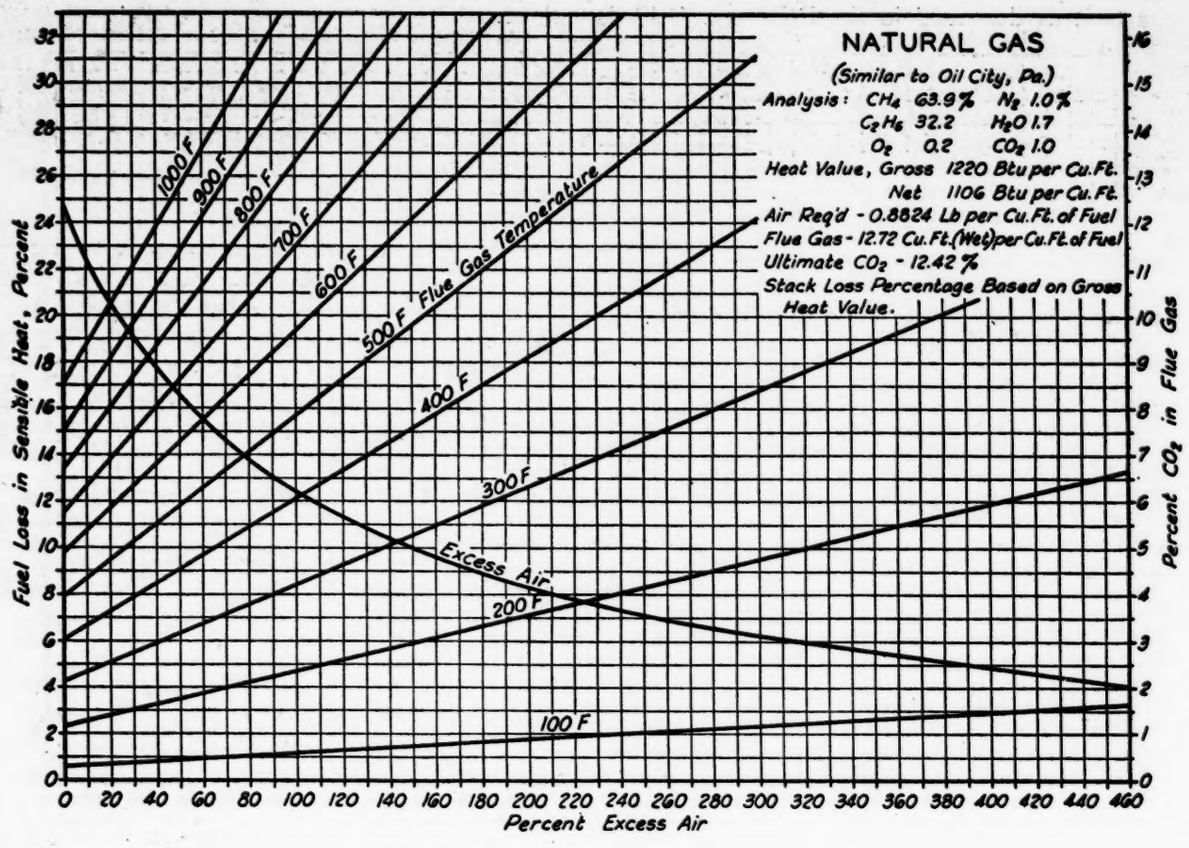
SENSIBLE HEAT LOSS IN FLUE GAS – BUTANE AND PROPANE

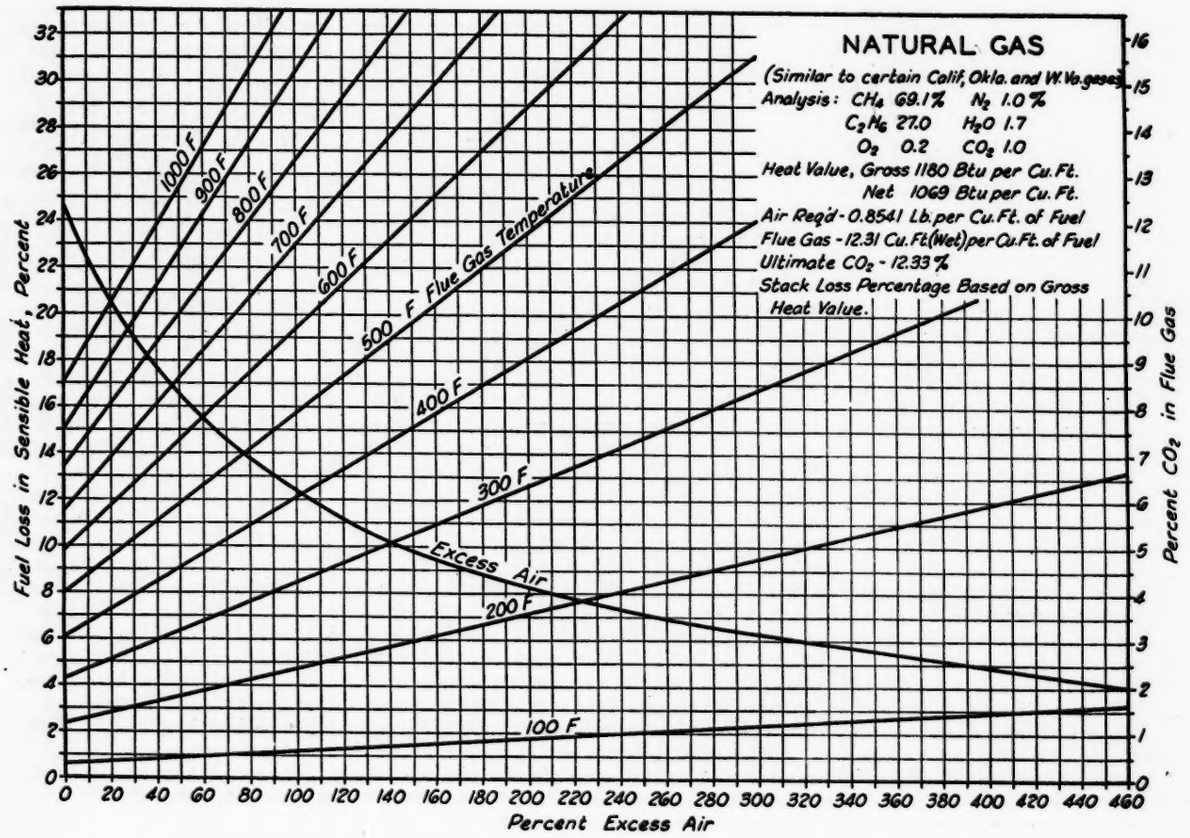
The accompanying charts are for determining the amount of excess air and the percent of sensible heat loss in the flue gas knowing the percent of CO_2 in the flue gas. The use of the charts is as described in the February, 1949 data sheet.


BUTANE
Analysis: C_4H_{10} 93.0% C_3H_8 7.0%
Heat Value, Gross 3225 Btu per Cu. Ft.
Net 2977 Btu per Cu. Ft.
Air Req'd - 2.326 Lb per Cu. Ft. of Fuel
Flue Gas - 32.93 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 14.0%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air


PROPANE
Analysis: C_3H_8 100%
Heat Value, Gross 2572 Btu per Cu. Ft.
Net 2371 Btu per Cu. Ft.
Air Req'd - 1.818 Lb per Cu. Ft. of Fuel
Flue Gas - 25.99 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 13.7%
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
200 F
100 F
Excess Air
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

HEAT LOSS IN FLUE GAS – PENNA. AND CALIF. NATURAL GAS


NATURAL GAS
(Similar to Oil City, Pa.)
Analysis: CH_4 63.9% N_2 1.0%
C_2H_6 32.2 H_2O 1.7
O_2 0.2 CO_2 1.0
Heat Value, Gross 1220 Btu per Cu. Ft.
Net 1106 Btu per Cu. Ft.
Air Req'd - 0.8824 Lb per Cu. Ft. of Fuel
Flue Gas - 12.72 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 12.42 %
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
Excess Air
200 F
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air


NATURAL GAS
(Similar to certain Calif, Okla. and W. Va. gases)
Analysis: CH_4 69.1% N_2 1.0%
C_2H_6 27.0 H_2O 1.7
O_2 0.2 CO_2 1.0
Heat Value, Gross 1180 Btu per Cu. Ft.
Net 1069 Btu per Cu. Ft.
Air Req'd - 0.8541 Lb. per Cu. Ft. of Fuel
Flue Gas - 12.31 Cu. Ft. (Wet) per Cu. Ft. of Fuel
Ultimate CO_2 - 12.33 %
Stack Loss Percentage Based on Gross Heat Value.
1000 F
900 F
800 F
700 F
600 F
500 F Flue Gas Temperature
400 F
300 F
Excess Air
200 F
100 F
Fuel Loss in Sensible Heat, Percent
Percent CO_2 in Flue Gas
Percent Excess Air

Experience is my Classroom

By T. W. REYNOLDS

• GETTING THINGS TOO BIG

It has often been said that you can never get things too big and that you can always damper down, but not up. Don't believe this, or rather accept it with moderation, for there are many things that cannot be dampered down and some that can easier be added to and built up than taken apart and reduced. Things can be made too big and too good, as one will realize better should he take the trouble to set down the various mechanical difficulties he has experienced through life in this connection.

Take the boiler for example. Too big, and it seriously reduces the available draft, due to high efficiency of heat extraction and the resistance of over-abundant flueways and passes. There is more water to heat up, greater heat losses from the setting, more soot deposit from overcooled and low velocity gases, too much condensate in the system in a given time, and more air leakage. The boiler takes up more space and requires more insulation and a larger smoke pipe, may even require a pit, and if the chimney size is based on boiler capacity, then the chimney also becomes too big.

A boiler not too big may be so in some part, such as in the cross-sectional area of the flues where the central core of heated gases pass out to the chimney without once contacting the water-backed, heat-absorbing surfaces. Too large a grate, a frequent complaint, and too much fuel is wasted. Too large an oil burner nozzle and the temperature of gases in the stack are too high. Soot settles more quickly in oversize breechings. Oversized pumps delay the return of water to boilers, then finally flood them.

An oversize chimney requires a lot of heat to warm up its construction and with each start finds a lot of cold air to buck. Slower moving gases will give much less friction within the chimney, but its friction surface has increased and its area is so large that recirculation and eddies within the chimney cause a lot of friction. Such a chimney is also susceptible to downdrafts and contains too much cooling area.

A fast steaming boiler, large burner, big pipes and large capacity quick vents fill a system on start-up with too much condensate. Return pipes too liberally sized contain too much air, a burden to a vacuum pump; in fact, the smaller and shorter all pipes are in the system the less there will be of air to expel at pump or vents. The same applies to radiators. Oversize them and they overheat and contain more air and if overlong they seldom fill with steam.

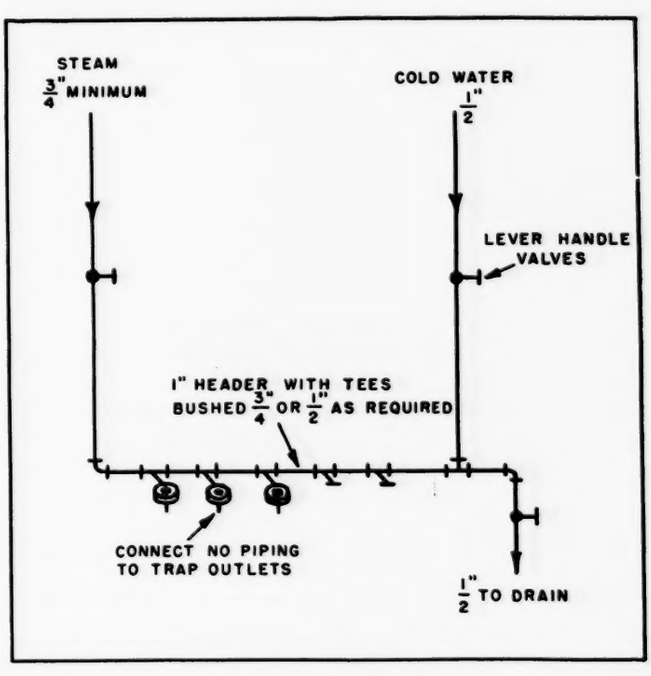
As for the air conditioning system, ceiling outlets too large handle cold air at low velocity and drop it down on your head, while too much air from the fan gives too much air movement in the conditioned space. Large return ducts settle dust and lint within them to create a fire hazard. Oversize or overlong air heating coils tend to freeze up and a refrigerating compressor of the centrifugal type, if too big, is apt to whine and be hard to hold down on light load.

Pressure reducing valves on steam are usually sized so large that they wire draw, while by-passes around them are often so large that manual throttling becomes extremely difficult.

• TEST RACK FOR STEAM TRAPS

In many buildings there are a multitude of steam traps in the heating system. Quite often they are of several makes, the result of an effort to find a make that works. However, it isn't the make that causes the troubles. It is rather the lack of convenient facilities for testing the traps, plus an understanding of how a trap should work.

During the heating season one can feel for a particular hot return branch and so determine that a certain trap is not working, but this is a poor time to interfere with heating, and a busy time for the steamfitter. With the test rack shown in the accompanying sketch, traps need not wait for winter test in building operation, but can be tested at leisure during



Test Rack for Steam Traps

Note: Mr. Reynolds is Chief, Air Conditioning Division, Abbott, Merkt & Co., Engineers, New York.

the summer months—and much more intelligently so.

By means of the rack many traps of various sizes can be tested at a time. Cracking the valve on the cold water line with the lever handle, a trap is cooled and it passes water. A shot of steam is then given the trap, then some water, repeating the cycle, say, three times, and noting the reaction.

A trap may be found with a hole in the bellows, or it may be too quick to close and hold up water. A trap should close in 20 to 25 seconds and meanwhile will blow a small quantity of vapor. Adjusting the trap so that no vapor is discharged would cause the trap to hold up water. The disc of a trap should be cooled before removing the cap and disc assembly. Excess force may distort the disc and make it inoperative. A disc wrench or other thin wrench should be used.

The caps should be cleaned with a cloth moistened with kerosene or light machine oil, making certain that the threads and face of the boss (into which the discs screw) are free from dirt. The flange and threaded portion of caps will not form a tight joint with their bodies unless well cleaned. Other parts that require cleaning are trap bodies and any float mechanisms. Pivot pins of float valve mechanisms require lubrication with graphite grease. All strainers and scale pockets ahead of traps and controls should also be cleaned out.

• CFM PER TON

A handy figure to have around when making quick approximations or preliminary work in air conditioning is the cfm required by the supply fan for each ton of sensible heat gain in the conditioned space. For the more usual indoor and outdoor design conditions and with 60F conditioned air supply, this figure will not vary appreciably from 600, but for other temperatures of the air supply, the rule of thumb figure will vary rapidly (see Table 1). This must be kept in mind or some sizable errors will occur.

Although the total air or air circulated by the fan is based on the sensible heat gain of the conditioned space, and not on the sensible heat gain of the population, we commonly take 25% of the total air as the air to be taken from outdoors, simply because we don't know any better figure for simple use. It's a very rough approximation, however, and runs into money.

If we raise the temperature of the conditioned air supply, we still keep the 25%, but should not. For example, if the quantity of outdoor air supply (154 cfm) in Case 1 of the table is satisfactory at 25%, the same quantity should be equally as satisfactory in Case 7 at 18%. If this be so, we should maintain the outdoor air supply always the same insofar as quantity goes, but reduce it in percentage as the total air is increased for less usual conditions. Tons of refrigeration will then remain unchanged.

There is one other factor which may make conditions worse, but could on the other hand be compensating; that is, who knows when the setting of the outdoor damper is giving 25% and, we might add, who cares. Perhaps the best setting is one as determined by the nose when used in the conditioned air space. When there is an odor present just open the outdoor air damper that distance which causes the odor to be gone.

With the usual design it works out that just about six air changes of total air is required and at least this quantity is required in areas of normal height for proper distribution of temperature and humidity. At 25% this gives 1.5 air changes of outdoor air, certainly enough to pressurize the space against most infiltration, unless there is an unusual exhaust from the conditioned space. For pressurization, there should be at least one-half air change of outdoor air in addition to the quantity required as make-up for exhaust.

TABLE 1

Case No.	CFM Per Ton Room Sensible Heat Gain	Design Conditions				Supply Air, F	*Tons of Refrigeration
		Out-Door	In-Door	Outdoor Air %	Outdoor Air CFM		
1	615	95/75	78/50	25	154	60	1.42
2	855	95/75	78/50	25	214	65	1.59
3	615	95/75	78/50	50	308	60	1.84
4	615	95/75	78/50	100	615	60	2.68
5	855	95/75	78/50	50	428	65	2.18
6	855	95/75	78/50	100	855	65	3.36
7	855	95/75	78/50	18	154	65	1.42
8	583	95/75	80/50	25	146	60	1.38
9	615	95/78	78/50	25	154	60	1.40

*Per Ton Room Sensible Heat Gain. Excludes Tonnage for Room Latent Heat Gain.

• UNIT HEATER THERMOSTATS

The writer of a letter I have just finished reading wants to know whether the locating of a thermostat on the recirculating side of a unit heater would make the heater susceptible to erratic control due to heat from piping. The answer is simple—don't run the piping too near. Actually, it is hard to see how the piping could be close by, except possibly where the condensate pipe requires a lift. In such a case, the necessary rise should not be thoughtlessly made immediately in the return air close to the heater.

What was not asked, but should be thought of, was how good will the control be considering its lofty environment. Well, it won't be bad in some installations, but in high locations, say 15 ft, it won't be so good. This comes about due to heated air accumulating at the roof from convection or sun effect with consequent delay in the starting of the fan. One way to solve such a problem is to keep the fan running and have the thermostat modulate the steam valve in the supply line. The continuous action of the fan will then break up or rather prevent any air stratification.

Intermittent operation of the fan is sometimes satisfactory, such as in low installations, or below skylights to prevent down-drafts. It is ideal in the case of heat for sprinklers only, especially so with unit heaters of low velocity type without deflectors, thus keeping the maximum amount of heat stored at the ceiling.

NEWS OF EQUIPMENT AND MATERIALS

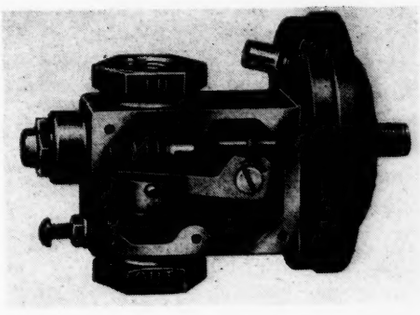
Aldrich Boiler-Burner

NAME—Bantam boiler-burner.
PURPOSE—A boiler-burner unit designed for the 4- or 5-room small house.
FEATURES—Unit is a vertical, steel, fire-tube type boiler with an Aldrich model CX oil burner especially designed for this boiler. Unit can fit into a kitchen or utility room. Boiler has completely submerged flue tubes, spiral turbulators, and an easily replaceable combustion chamber. The welded steel boiler main shell is insulated from the outer shell by a 2-inch insulation blanket. Tubes and spirals can be conveniently cleaned by removing the smoke pipe connection at the top of the boiler. The domestic hot water coil is a double wrapped copper tube surrounding the boiler tube. It can be removed through an outlet on top of the boiler. Unit is available with or without wiring, circulator, valves, draft stabilizer, manifold, and special controls.

SIZES AND CAPACITIES—Unit stands 45 inches high and occupies a floor space of 20 x 33 inches. Maximum rating is 100,000 Btu per hr; hot water standing radiation of 440 sq ft, and steam of 285 sq ft. Unit is available for steam and hot water systems. Recommended firing rate is 0.75 gph.
LITERATURE AVAILABLE—Circular.
MADE BY—*The Aldrich Company, subsidiary of Breeze Corporations, Inc., Wyoming, Ill.* **208**

Superior Pressure Regulator

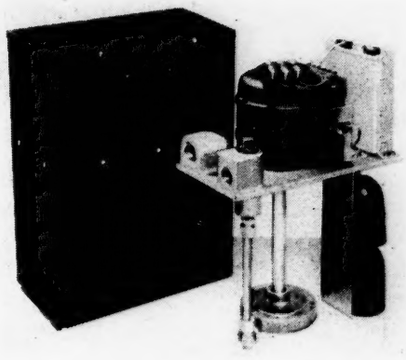
NAME — Superior steam pressure regulator, type A-21.
PURPOSE—For use where automatic control of steam pressure is necessary for a gas-fired boiler or steam generator.
FEATURES—An all metal lever action control is used. The slightest movement of the metal diaphragm has an effect upon the compound lever action to provide sensitive control on the line. A specially designed safety steam valve prevents steam from entering the gas chamber. This eliminates, it is said, the need for packing boxes or oil seals. Diaphragm cap and diaphragm surface are machined on a 13½ degree bevel to enable equal distribution of movement of the diaphragm in both directions from a balanced position. Diaphragm is cut from .018 spring brass. Valve is provided with a non-metallic Spauldite valve disc to insure freedom from corrosion and dirt accumulation. Seat is machined and hand ground. An adjustable bypass permits a sufficient flow of gas to the burner to prevent possible back firing. Valve will operate efficiently in any position.
SIZES AND CAPACITIES — Designed to operate on a maximum gas pressure of 1 lb. Steam pressure ranges



are 1 lb to 15 lb, 15 lb to 100 lb, 100 lb to 160 lb. Higher pressures available upon request.
LITERATURE AVAILABLE—Folder.
MADE BY—*Superior Regulator Co., Inc., 1835 S. Bonnie Brae, Los Angeles 6, Calif.* **209**

Eastern Condensate Unit

NAME—Model 2 condensate disposal unit.
PURPOSE—To provide disposal of small quantities of condensate from air conditioning equipment.
FEATURES—Designed to meet the requirements and specifications of the air conditioning field, unit incorporates fully automatic control, compact, rugged, rust-proof construction, quiet operation. Unit is provided with a bronze centrifugal sump type pump, a 1½-gal brass receiver, float operated switch, and a check valve on the outlet side of the pump. The pump is powered by a 1/40 hp single phase, 60 cycle, 115 volt, totally enclosed ball bear-



ing capacitor start motor that operates at 3450 rpm. Unit is encased in a brass cabinet. The inlet size of the pump is ¾-inch N.P.T., and the outlet is ½-inch N.P.T.
SIZES AND CAPACITIES—5¼ inches wide by 7⅞ inches long by 12 15/16 inches high. Pump can deliver 4¼ gpm and has a shut off pressure of 12½ lb per sq in. Weight is 21 lb.
MADE BY—*Eastern Industries, Inc., 296 Elm St., New Haven 6, Connecticut.* **210**

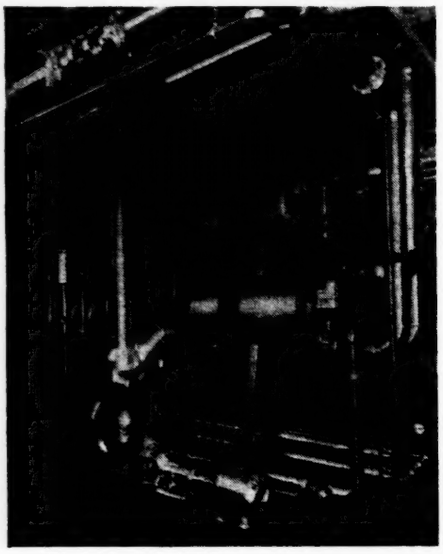
Glasfab Lagging

NAME—Glasfab lagging.
PURPOSE—To provide a woven glass fabric suitable for pipe lagging.
FEATURES—Material is woven entirely from glass fibers and is said to be rot-proof and impervious to moisture. It has no capillary action and does not char under the high temperatures of hot bitumen. Material makes it easy to provide a smooth application at elbows and joints. Being an open mesh material it is easily impregnated and may be used, it is claimed, with any type of waterproofing mastic or compound for hot or cold use.
SIZES AND CAPACITIES — Available in 2-, 4-, 6-, 8-, 10- and 12-inch widths up to 36-inch width.
MADE BY—*Lexington Supply Co., Dept. 107, 4815 Lexington Ave., Cleveland, Ohio.* **211**

Carrier Absorption Unit

NAME — Carrier absorption machine.

PURPOSE — For air conditioning purposes using water as a refrigerant and a simple salt as an absorbent.



FEATURES—Machine will operate on either high or low pressure steam or low pressure waste steam. Aside from a small solution pump, machine has practically no moving parts. It is lighter in weight and more compact than other heavy duty refrigeration units and is suitable for installation on rooftops, intermediate floors, or in basements. Machine uses less than 20 lb of steam per hour per ton of refrigeration regardless of steam pressure. It will automatically adjust itself to partial loads down to 15% of total capacity without loss of efficiency. When higher tonnages are required machine is adaptable to multi-unit installations. Single units are said to be able to air condition areas from 34,500 to 60,000 sq ft. While the absorption type refrigeration cycle is not new, since ammonia absorption systems have been used for some time, this unit uses water as a refrigerant instead of ammonia. This type unit makes it possible to use year around steam, and to obtain good operating economies where district steam service or natural gas is available.

OPERATION—Water temperature is lowered through flash evaporation of sprayed water. Evaporation is induced by a highly absorptive brine solution. Steam is used to drive off the excess water from this salt solution. The concentrated salt solution is pumped back into the absorber chamber thereby establishing a continuous cycle.

SIZES AND CAPACITIES — 115, 150 and 200 tons refrigeration.

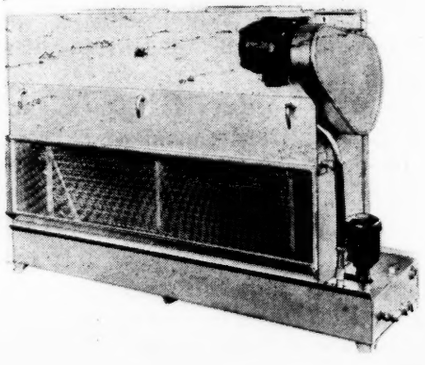
MADE BY — *Carrier Corporation, Syracuse 1, N. Y.* **212**

Bush Evaporative Condenser

NAME — Bush evaporative condenser.

PURPOSE — For condensing vapors and gases.

FEATURES—New line of condensers employs a V-belt drive from the motor to the fan. Bearings are self-aligning and each unit has two flange bearings at the case end. Larger units have one or two center bearings, depending on the shaft length. Double inlet, dynamically balanced centrifugal wheels are used for slow speeds and quiet operation. Top or front discharge can be supplied or a changeover from one to the other position can be accomplished in the field. In sizes 20 tons and larger, eliminator sections are constructed of fiberglas matting. Air velocities through this section are designed to remove entrained drops of water. Eliminator trays can be removed through the access door. A copper water distributing pan with a large number of properly spaced holes is used for good coil coverage. The 5, 7½, 10, and 15-ton sizes are provided with bronze fitted centrifugal pumps with integral vertically mounted motors. Inlet is mounted at bottom of the sump tank to prevent air binding. The larger sizes are supplied with a horizontal, bronze fitted centrifugal pump direct coupled to a separately mounted motor supplied in any standard current characteristic. Structural frame is made of welded steel angle iron hot-dipped galvanized after fabrication.



SIZES AND CAPACITIES—5-40 tons.

LITERATURE AVAILABLE—Bulletin.

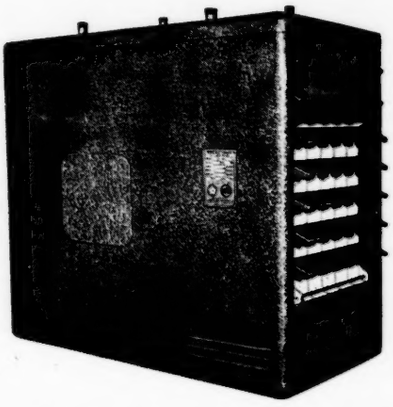
MADE BY — *Bush Manufacturing Co., West Hartford 11, Conn.* **213**

Pittsburgh Unit Heater

NAME—Pittsburgh gas unit heater, series CB.

PURPOSE—Industrial space heating, drying and ventilating.

FEATURES—A cast iron heat exchanger and combustion chamber are designed to withstand the corrosive effects of burning gases. Combustion chamber and heat exchanger are cast in one piece. The extended heating surface fins on the heat exchanger are cast integral. The cast iron burners have raised ports. The jacket, side panels and louvers are made of sheet metal. The draft hood, made of sheet metal, has a built-in draft diverter. Controls include a gas regulator, magnetic valve, gas cock, safety pilot, and high limit control. Motor operates a squirrel type fan.

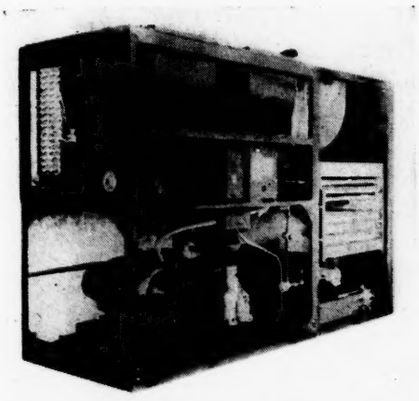


SIZES AND CAPACITIES—Available in five sizes with AGA output rating from 68,000 to 172,000 Btu per hr. Depending on size of unit, a 1/4, 1/3 or 1/2 hp motor may be used. Air delivery is from 1,200 to 3,500 cfm against static pressures up to 0.2 inches.

MADE BY—*Automatic Gas Equipment Co., 301 Brushton Ave., Pittsburgh 21, Pa.* **214**

Baker Central Station Unit

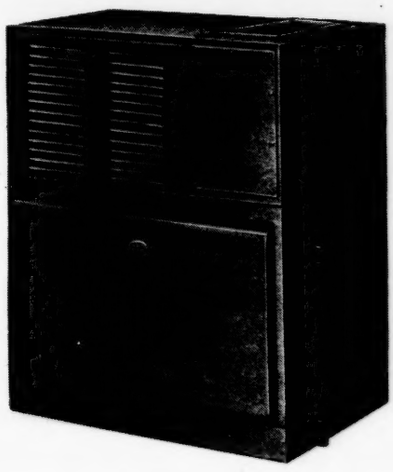
NAME—Baker Central-Air.
PURPOSE—Complete package central station air conditioning unit.
FEATURES—In a single housing are



located the compressor, evaporative condenser, air cooling, dehumidifying and air circulating unit, all complete with motors, pumps and controls. Unit is delivered fully assembled and charged, ready for operation as soon as electrical, water, drain and ductwork connections are made. Unit is shipped in two sections. The larger section contains the compressor with the cooling, dehumidifying, air-circulating equipment, and all motors, electric connections and controls, while the other has the evaporative condenser. Motors are 220 to 440 volts, 60 cycle, three-phase and are governed by a suction pressure control switch. Freon receiver is hung below the evaporative condenser. Water to spray heads of evaporative condenser is circulated from a sump.
SIZES AND CAPACITIES—Eight sizes in capacities of 5 to 40 tons refrigeration.
LITERATURE AVAILABLE—Bulletin.
MADE BY — *Baker Refrigeration Corp., South Windham, Maine.* **215**

Typhoon Evaporative Condenser

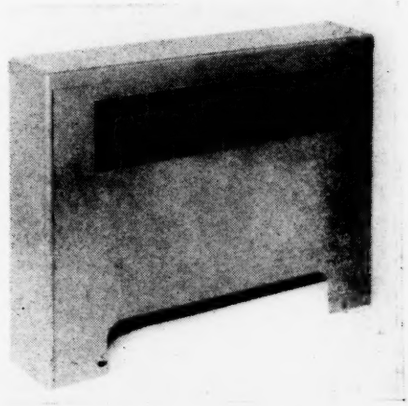
NAME—Typhoon evaporative condenser.
PURPOSE—To cool refrigerant gases such as Freon, methyl chloride, or other common refrigerants.
FEATURES—Unit is said to save 95% water costs and to eliminate waste water disposal. Condensing coil is constructed of continuous lengths of seamless copper pipe, pitched to allow rapid gravity flow of condensed liquid refrigerant. Tubes have been placed to insure even wetting and intimate scrubbing contact of air for good heat transfer. The blower, it is claimed, avoids contact with high humidity air or any entrained moisture because dry air is blown through unit. Spray nozzles are made of machined bronze castings to provide a coarse spray and complete coverage of coils at low pressure. The pump used consists of a bronze impeller and shaft directly connected to a ¼ hp motor with the pump impeller and casing immersed in the tank. Advantages for this type of installation are that no additional space for the pump is required and that possible



leakage through the packing gland is avoided.
SIZES AND CAPACITIES—Available in 3-, 5-, 8-, and 10-ton models.
MADE BY—*Typhoon Air Conditioning Co., Inc., Brooklyn, N. Y.* **216**

Universal Convector

NAME—Universal convector.
PURPOSE—Space heating.
FEATURES—Company is now producing a complete line of copper convectors for one-pipe steam, two-pipe steam, vapor or vacuum systems or circulating hot water systems. The one-pipe steam element is designed for quiet service and has a 1¼-inch pipe tap as a standard connection. Standard connections on the other systems are ¾-inch pipe taps, with different size tappings and connections for sweat fittings available on special order. Heating element consists of



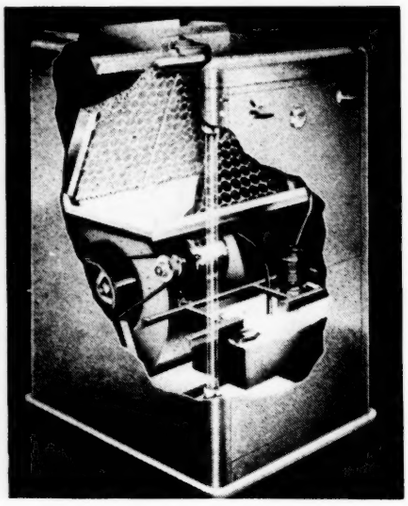
seamless copper tube mechanically bonded to aluminum fins. A damper in the cabinet can be supplied if desired.
SIZES AND CAPACITIES—Eight cabinet heights from 18 to 36 inches, and widths of 4, 6, 8, and 10 inches.
LITERATURE AVAILABLE — Bulletin 449.
MADE BY — *Universal Convector Corp., 224 Manida St., New York 59, N. Y.* **217**

Goodrich Heated Rubber

NAME—Goodrich electrically heated rubber.
PURPOSE—For heating applications by electricity based on the use of resistance wires insulated with special layers of rubber sheeting.
FEATURES—The electrically heated rubber is constructed of resistance wires insulated with fabric plies sandwiched between layers of rubber sheeting with the parallel wires running the length of the rubber. Rubber can be furnished in any reasonable size, shape or weight, and for temperatures up to 300F. Heating of the rubber starts when it is connected to an electrical outlet and its operation is controlled by thermostats. Each application in which the heated rubber is used must be engineered separately, with size, voltage and temperature desired entering into the design calculations.
MADE BY—*The B. F. Goodrich Co., Akron, Ohio.* **218**

Brundage Air-Renewer

NAME — Brundage air - renewer, model 713-A.
PURPOSE—To clean, purify and humidify air in a home.



FEATURES — Triethylene - glycol is used in the unit to control humidity, to sterilize the air, as well as to clean it. Besides this ingredient, the unit uses ultraviolet light to destroy air-borne bacteria. By means of a set-screw adjustment the unit can be regulated to control the humidity from 20 to 50%. Once the setting is established the desired humidity is automatically maintained. The wetting channel is a perforated trough of stainless steel to distribute the liquid over the entire surface of the filter. A stainless steel inner casing holds the filters and trough. Rubber gasketing prevents air by-passing the filters. A pump recirculates the liquid to the wetting channel above the inlet filter and this pump is supported on a rubber mounted frame which also supports the float valve. A small stainless steel tank holds the glycol-water solution. A set-screw raises or lowers this reservoir and delays or accelerates the opening of this float valve. An over - sized Brundage blower is used with self-aligning bearings and a top mounted motor.
OPERATION—Air from the house enters the inlet filter and passes through the glycol-water saturated filter. Here the proper amount of moisture is added to the air and all impurities are removed. The air now passes through a second filter element, an eliminator mat, which is designed to remove any entrained liquid droplets. Air is now treated by a germicidal lamp before it passes through the blower. The air, after being heated, is returned to the room.
SIZES AND CAPACITIES—Unit illustrated is designed for 1,200 cfm with a 1/4 hp blower motor and 1/30 hp pump motor. Model 710F available for 600 cfm and 715-A for 2,200 cfm.
LITERATURE AVAILABLE — Bulletin 749.
MADE BY — *Brundage Company, 528 N. Park St., Kalamazoo 11, Mich.* **219**

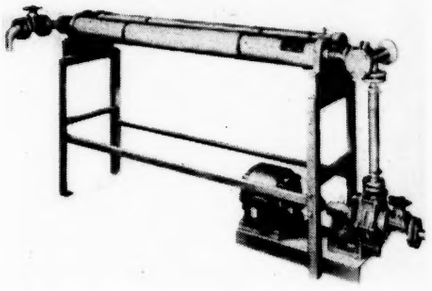
Electromode Wall Heater

NAME — Electromode Bilt-in-Wall heater, model WA-12.
PURPOSE—Space heating.
FEATURES — A thermostat dial which may be set over an operating range of 55 to 85F is part of the automatic control for this unit. Thermostat is made of a heavy duty switch combined with a sensitive bulb which is influenced by changes in room temperature. Thermostat is integral part of the heater. Air is drawn in at the top of the heater, passes through 480 to 680 sq in. of the heating element, and the warm air is forced out at the bottom at a rate of 125 to 160 cfm. Six-blade fan and motor are designed for quiet operation. Cast aluminum fins provide greater heat transfer. Makers claim that the sealed-in heating element cannot cause fire or burns.

SIZES AND CAPACITIES — Available in sizes from 1,500 to 4,000 watts, 115 to 220 volts, and having a heating capacity from 5,122 to 13,660 Btu. Weight of unit, 42 lb. Unit is 14¼ inches wide and 18¼ inches high, and extends 1 inch from wall.
LITERATURE AVAILABLE—Illustrated folder.
MADE BY—*Electromode Corp., 45 Crouch Street, Rochester 3, New York.* **220**

Industrial Heat Exchanger

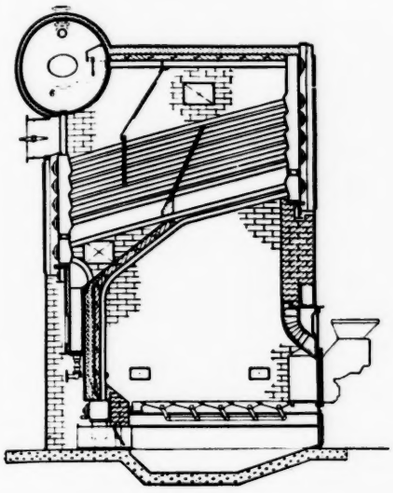
NAME—Industrial unit heat exchanger.
PURPOSE—Heat exchanger for plating solutions.
FEATURES — Construction design permits the use of the same unit



for both heating or cooling the solution as operating conditions require. Nickel tubes are used for nickel solutions while steel and special alloy tubes are employed for other applications. Exchangers can be furnished as a unit with a combination of from one to six tubes in multiple for a variety of heat exchange capacity. Tubes can be had separately for wall or ceiling mounting or they are available complete with pump and stand for placement on the floor. Rubber lined headers and diaphragm valves are used throughout. Connections required for the unit are steam line, circulating hose line to and from the plating tank, steam trap and condensate drainage to waste line, and cooling water.
SIZES AND CAPACITIES — Available in five models ranging from one to six tubes.
MADE BY — *Industrial Filter & Pump Mfg. Co., 1621 W. Carroll Ave., Chicago 12, Ill.* **221**

Springfield Boiler

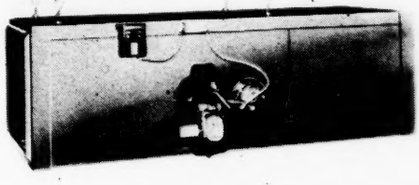
NAME—Springfield type M boiler.
PURPOSE—Boiler designed for coal firing with standard stokers for use in small and medium size plants,



or for standby service in larger plants.
FEATURES—Although designed for coal firing, unit can be adapted to oil or gas firing without any major change. All parts are externally supported for simple erection and accessibility. Through the use of a water wall type construction on the rear wall and arch over the combustion chamber, a considerable part of the total steam generating surface is said to have been disposed to absorb radiant heat with a consequent increase in operating efficiency. All boilers in this line have 48-inch diameter welded and stress-relieved steam drums built to various pressure standards ranging from 160 to 320 lb per sq in. Average setting height is 18 ft for all sizes. Standardized construction for boilers of different sizes is made possible by using the building block principle which is inherent in this special header design. Erection at the site is facilitated by shop assembly of a considerable portion of the parts, including the header sections with built-in refractory filled cast iron baffles.
SIZES AND CAPACITIES — Made in two standard tube lengths of 10 and 12 ft expanded into sinuous sectional headers. Furnace width varies from 4 ft 7½ inches, to 9 ft, depending on the number of header sections used. Six sizes range from 7,500 to 17,000 lb steam per hr generating capacity.
MADE BY — *Springfield Boiler Co., 1945 E. Capitol Ave., Springfield, Ill.* 222

J & C Suspension Unit

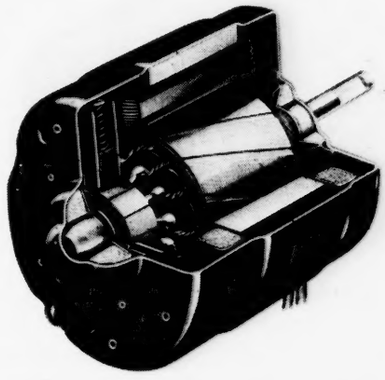
NAME—Jackson & Church oil-fired suspension unit, model OL-180-S.
PURPOSE—Space heating.
FEATURES—Unit is supplied with all controls, burner and fan completely installed and wired. The unit, which is designed as a suspension type oil-fired unit, has a two-stage pump oil burner and a centrifugal squirrel cage type blower. Filters in the unit are easily removed for cleaning. Eyebolts are installed at four points to aid in hanging the unit. The stack is so arranged that the condensate will not drain back into the heater. Makers claim an efficiency of 89% and CO_2 as high as 11%.
SIZES AND CAPACITIES—180,000 Btu



input. Dimensions, 23 x 27 x 74 inches. Weight, 575 lb.
MADE BY—*Jackson & Church Co., Saginaw, Mich.* 223

Micromotor

NAME—Redmond type J Micromotor.
PURPOSE—For general use requiring a small fractional horsepower motor.
FEATURES—Commutator has insulated bars to provide quiet, smooth performance. Silicon electric steel is used in the armature and field laminations. Shaft composed of carbon steel is precision ground and polished. Spring tension individually fitted bearings are used for exact alignment. Large oil reservoirs are packed with highly absorbent felts to provide a continuous flow of lubricant to the porous bronze bearings. Noise is eliminated from end play by individual adjustment of the end thrust of each motor.
SIZES AND CAPACITIES—1/10 hp, direct current.



LITERATURE AVAILABLE—Folder.
MADE BY — *Redmond Company, Inc., Owosso, Mich.* 224

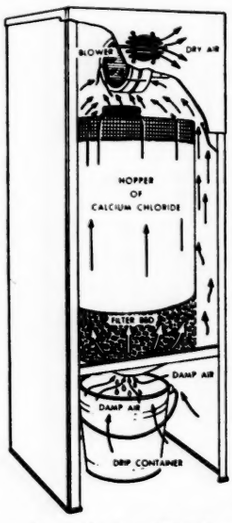
Acme Ignition Transformer

NAME—Acme oil burner ignition transformer.
PURPOSE—Ignition of fuel oil in oil burner installations.
FEATURES—Makers claim that the transformer has a secondary current of intensity sufficient to ignite even the lowest viscosity of commercial and residential fuel oil. Cores of transformer are constructed of high grade silicon steel laminations and assembled with vacuum impregnated coils installed in a waterproof and splash-proof casing and sealed in a special heat and moisture resisting compound. It is claimed that due to certain construction features, transformer when operating will not cause a disturbance in the electrical circuit to affect radio reception.
MADE BY—*Acme Electric Corp., Cuba, New York.* 225

Arid-Aire Dehumidifier

NAME—Arid-Aire dehumidifier.

PURPOSE — For eliminating excessive moisture from basements, recreation rooms, and storage areas.



FEATURES—Calcium chloride flakes are employed as the basic dehumidifying agent. Moisture laden air in the room is pulled from the floor area, first through a filter bed of coarse carbon that has become saturated with the calcium chloride solution, and then the air passes around a mesh hopper containing the flakes. The dehumidified air is forced out of the top by a 3⅝-inch diameter centrifugal blower powered by a 1/50 hp motor running at 3,000 rpm. Fan can deliver 100 cfm. Hopper has a capacity of holding 75 lb of the flakes. To fill the hopper it is only necessary to switch off the blower motor, raise the lid, and then add the necessary flakes. Under average operating conditions one hopper full of flakes should last from eight to ten weeks, and the 5 gal drip container will require emptying after two to three weeks' operation.

SIZES AND CAPACITIES — At 72F, 95% R.H. rate of moisture removal is about 0.425 lb of water per hr. At this rate of moisture removal, the use of calcium chloride flakes is 5.5 to 6 lb per day.

MADE BY — *Air Appliances Co., P.O. Box 5487 Indianapolis, Ind.* **226**

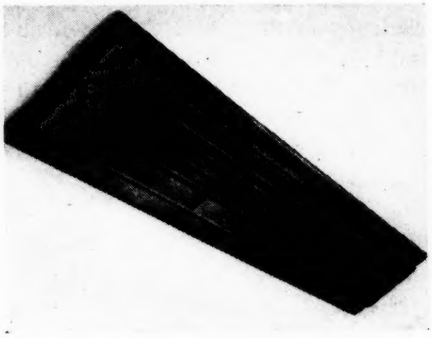
Anemostat Air Diffuser

NAME — Anemostat straight-line aspirating air diffuser.

PURPOSE—Designed for air distribution in railroad cars, buses and other installations requiring long rectangular units.

FEATURES — Air distribution is equalized throughout the length of the unit by means of adjustable volume shutters that are accessible on the face side of the unit. Shutters can be adjusted along every foot of the outlet. Diffuser is fabricated so as to facilitate its use in individual panels of varied lengths. It can also be assembled into continuous extended strips. Combinations are available with or without continuous or individual lighting fixtures. Units may be mounted back to back to form one diffuser or may be separated so as to accommodate lighting arrangements. Makers claim up to 40% aspirating action—that is, 40 cu ft of room air is drawn in and mixed with every hundred cubic feet of incoming duct air before the mixture is released to the enclosure.

SIZES AND CAPACITIES — Standard length of diffuser is 60 inches, although this can be varied to suit



the user's needs. Air quantities handled are 15 to 20 cfm for each foot of diffuser length. Tip velocities are about 700 fpm through the valving arrangement when handling design air quantities. Maximum static resistance is 0.2 inches of water.

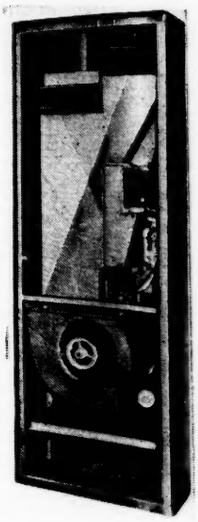
MADE BY—*Anemostat Corporation of America, 10 E. 39th St., New York, N. Y.* **227**

Norge Furnace

NAME — Norge gas-fired furnace, model GHF 625.

PURPOSE—Space heating.

FEATURES—Occupying less than 3 sq ft of floor space, shape of unit is said to make it ideal for placement between studdings so that it can be installed fitting almost flush to the wall. Unit can be placed in the basement, utility room or closet. Ducts can be connected to the built-in plenum chamber for use as a blower-driven furnace. Unit comes with all equipment and controls fully installed, such as safety shut-off control and automatic thermostat controls. Combustion chamber and heat exchanger are made of 12-gage steel. Dynamically balanced blower delivers 450 to 600 cfm against 0.2 inch static pressure.



SIZES AND CAPACITIES — Unit measures 12¼ inches deep, 32 inches wide and 88 inches high. It has an input capacity of 62,500 Btu.

MADE BY—*Norge Division, Borg-Warner Corp., 670 E. Woodbridge, Detroit, Mich.* **228**

U. S. Gauge Thermometer

NAME—U. S. Gauge refrigeration thermometer.

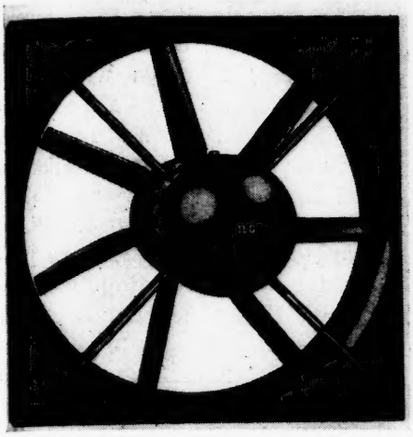
PURPOSE—Refrigerating thermometer of the glass tube type.

FEATURES — Thermometer has a flexible copper connecting tube running to the temperature responsive bulb so that it is possible to place the thermometer so that it will be fully protected and easy to read. The thermometer has a large diameter capillary bore to provide a clear red line for reading. A well at the top of the tube protects the thermometer from damage through overtemperatures. Unit is available in various ranges from —50 to 300F.

MADE BY—*United States Gauge, Sellersville, Pa.* **229**

Ilg Farm Fan

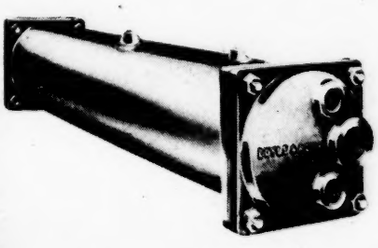
NAME—Ilgfarmaire.
PURPOSE—Fan designed especially for farm drying and cooling operations.



FEATURES—Unit has cast aluminum fan wheel of special construction to operate against the resistance set up by the products being dried. It is operated by a 5 hp, 1140 rpm, 220-volt, one-phase, 60-cycle, Ilg ball bearing capacitor motor. Since 5 cfm of air is recommended for drying each bushel of corn and 15 cfm of air is recommended for each 15 ft of mow area, unit is considered capable of handling almost all cribs and mows. The steel panel has a streamlined inlet for increased fan efficiency.
SIZES AND CAPACITIES — 42-inch direct-connected fan will deliver 25,000 cfm at ½-inch static pressure and 20,000 cfm at ¾-inch static pressure.
MADE BY—*Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago 41, Ill.* **230**

D & R Junior Condenser

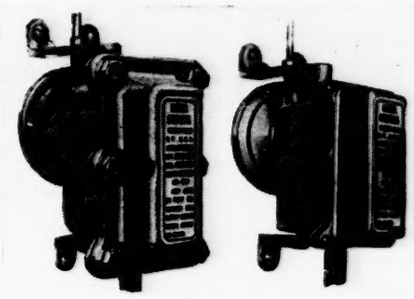
NAME—D & R junior condenser.
PURPOSE—Condenser for use with Freon-12 and methyl chloride.
FEATURES—Condenser tubes are rolled into reamed and serrated holes to insure leak-proof construction. The fin type tubes may be easily removed and replaced when necessary, and can be cleaned easily. Pump down capacity for refrigerant storage eliminates the need for a receiver.



SIZES AND CAPACITIES — Available in sizes from 1½ to 25 tons and with pump down capacity from 24 to 130 lb Freon. Twelve tubes are used in the 1.5-ton type and 72 tubes in the 25-ton size. Available in 4 to 12 passes.
MADE BY—*Doyle & Roth Mfg. Co., Foot of Hawkins St., Newark 5, N. J.* **231**

Coral Pressure Control

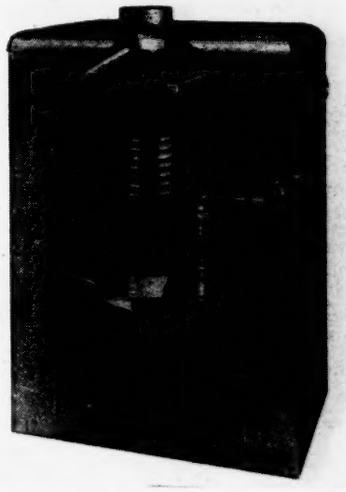
NAME—Coral pressure control.
PURPOSE—For use on low pressure applications in hazardous locations, such as exist in chemical plants,



for controlling the static pressure in the intake of a duct or to actuate an alarm when the pressure drop across a filter reaches a predetermined value.
FEATURES—Besides the explosion-proof type (left), controls are also available in a dust-proof model (right), for use in dusty atmospheres. Switch assembly and all electrical connections are enclosed. All exposed surfaces are copper plated to prevent rust from forming on the metal-to-metal surfaces. Provisions are made to permit installation and connection with ½-inch conduit. Controls are obtainable in standard ratings from zero to 20 inches of water column pressure or vacuum with range adjustment and with fixed differentials of 0.2 to 2 inches of water. They are also available with double throw circuits or floating contacts for use in connection with reversing type damper control motors. Electrical ratings approved by Underwriter's Laboratories are 10 amperes, 125 volts, or 5 amperes, 250 volts, a-c.
MADE BY—*Coral Designs, P.O. Box 243, Forest Hills, N. Y.* **232**

Burkay Boiler

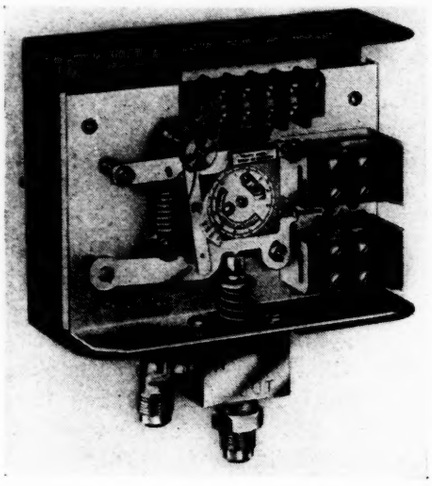
NAME—Burkay boiler, HW-110.
PURPOSE—Space heating for apartments and the small home with gas as fuel.
FEATURES—All parts in contact with water are copper, brass or bronze. The heat exchanger is lead-alloy coated for additional protection against products of combustion. The heat exchanger exposes one quart of water to 30 sq ft of tubing and fins. All controls are AGA certified. A Baso safety pilot is used for automatically shutting off the main gas supply in case of pilot failure. Standard equipment includes a 1½-inch circulator. Two series of tightly wound coils form the combustion chamber. The Burkay employs two stages of primary air entrainment plus an auxiliary secondary air supply to produce, it is said, high combustion efficiency. Flame ports are protected from clogging.
SIZES AND CAPACITIES — Maximum AGA rating in Btu output, from 80,000 to 88,000 depending on the type of gas used. Boiler measures 3 ft high, 2 ft wide, and 1.5 ft deep.
LITERATURE AVAILABLE — Bulletin SPB-701.
MADE BY — *Burkay Div., A. O. Smith Corp., Toledo 7, Ohio.* **233**



Penn Defroster

NAME—Penn automatic hot gas defroster, series 321.

PURPOSE—For use on refrigeration equipment where the usual frost conditions occur.



FEATURES—Control provides automatic defrosting of evaporator coils at predetermined time intervals with a minimum effect on the refrigerated space. Unit has a mechanical valve and a heavy duty two-pole contact structure, both actuated by the same timing mechanism. The brass valve is heavily spring-loaded for high seat pressure to remain tightly sealed against pressures up to 200 lb. The motor which operates both valve and timing mechanism, is a self-starting synchronous timing motor with sealed gear train running in oil. The two-pole electric switching action incorporates a removable contact block with heavy duty snap action silver contacts.

OPERATION — A synchronous self-starting electric motor closes a pair of contacts to start the compressor motor and simultaneously opens a mechanical by-pass valve to permit hot gases to flow from the high pressure side of the compressor through the evaporator, thereby defrosting the evaporator coils. Another pair of contacts, which open at the start of the defrost period, is available for breaking the circuit to the circulating fans where this action is desired.

LITERATURE AVAILABLE—Illustrated folder.

MADE BY—*Penn Electric Switch Co., Goshen, Ind.* **234**

Cadwell Relief Valve

NAME—Cadwell safety relief valve No. 200.

PURPOSE—Relief valve for low pressure heating boilers.

FEATURES—Valve has been designed to take care of possible dangerous overpressures that may develop in the heating system. It will relieve small amounts of pressure created by heat expansion of water as well as steam. Valve is built according to ASME low pressure heating boiler code specifications and has been tested by The National Board of Boiler & Pressure Vessel Inspectors.

SIZES AND CAPACITIES—Provided with 1 inch I.P.S. connection. Water capacity, 1,500 gph at 30-lb pressure; steam capacity, 597,000 Btu per hr.

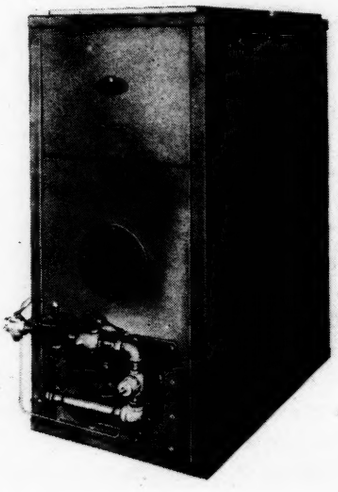
MADE BY—*The Beaton & Cadwell Mfg. Co., New Britain, Conn.* **235**

Century Gas-Fired Furnace

NAME — Century convertible gas-fired winter air conditioner.

PURPOSE—Space heating for the home.

FEATURES—A heat distributor is used designed to create uniform flow of combustion gases along the walls of the primary heating chamber. The primary heating chamber is of steel all-welded construction. Secondary heating radiators are used to provide extra heat transfer. Both the blower motor and blower are mounted on rubber to insure quiet operation. Motor is protected against overloading to prevent burning out the unit. Blower has self-aligning bearings with large oil cups. Two 16 x 20-inch replaceable spun glass filters are used. A down-draft diverter is installed to avoid down-draft from extinguishing burner or pilot flame. Stack connection at rear of furnace provides for a neater installation. By removing the burner plate, a switch can be made from gas to oil use.



SIZES AND CAPACITIES — 53 inches high, 43 inches deep and 24 inches wide. Input rating is 100,000 Btu per hr. Blower motor ¼ hp.

LITERATURE AVAILABLE—Folder.

MADE BY — *Century Engineering Corp., Cedar Rapids, Iowa* **236**

P-C Building Wall

NAME—Pittsburgh Corning curtain wall.

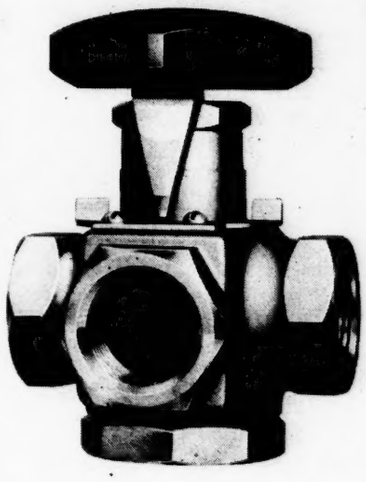
PURPOSE—Curtain wall constructed of cellular glass and concrete adaptable for general building use.

FEATURES—Panels are made in the flat in any practical size. Largest panels made to date have been 256 sq ft each. Popular thickness is 6 inches, which means that the material has a 2-inch cellular glass core with 2-inch exterior and 2-inch interior veneers. Heavy mechanical troweling, steam curing, and/or vacuum processing result in a dense concrete panel for this building material. No additional finishing is required on the exterior or interior faces unless desired. Attractive finishes can be achieved in the casting procedure. Wall is said to provide a vapor seal and waterstop. Makers claim that there are no cold spots in these walls, not even at joints. At joints, moisture migration is controlled by the use of a mastic joint sealing material. In the popular size, panel wall weighs from 40 to 60 lb per sq ft, depending on the aggregate used.

MADE BY — *Pittsburgh Corning Corp., 307 Fourth Ave., Pittsburgh, Pa.* **237**

Panel-Flo Valve

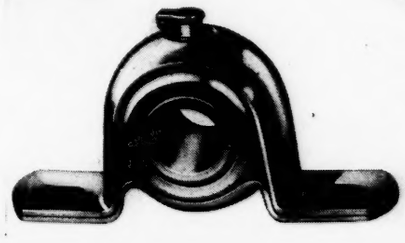
NAME—Hoffman Panel-Flo valve.
PURPOSE—For balancing individual panels in a radiant heating system.
FEATURES—With this type valve individual panels can be adjusted



without adjusting the other panels. There is an indicating dial for accurate setting. Water flow through the panel can be reduced by approximately 60%. Water is bypassed around the panel directly to the return line when such a condition is necessary. Of all brass construction, the valve is designed for 125 lb pressure per sq in. It is available in a ¾-inch iron pipe size tap.
MADE BY—*Hoffman Specialty Co., 1001 York Street, Indianapolis 7, Ind.* **238**

Hiawatha Pillow Block

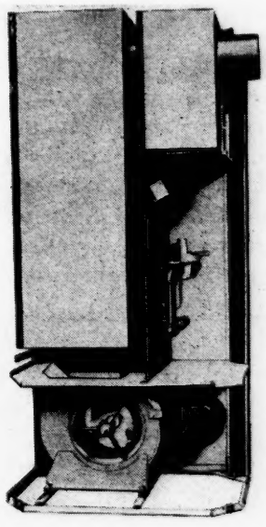
NAME—Hiawatha pillow block.
PURPOSE—To provide support of revolving shafts such as is used in blowers and fans.
FEATURES—Pillow block is offered with a porous (sintered) bronze bushing and is of all steel construction. Bearing is constructed in such a way that the entire ball is



hollow and yet the bushing is completely supported internally except where allowance is made for oil infiltration of the bushing. Thus a large oil well is provided which is packed with oiled wool felt wicking. Open space in the felt, directly under the oil cup, provides a receiving chamber for a large volume of oil when reoiling. The method of manufacture allows for close bore tolerances. The oil cup relief hole in the strap may be placed in any position to allow for various mounting positions. The bearing may be mounted without adjustment due to the new strap design.
SIZES AND CAPACITIES—½, ⅝, ¾ and 1 inch.
MADE BY—*Ideal Products Co., 68 Lake Drive, S.W., Oshkosh, Wisconsin.* **239**

Meyer Furnace

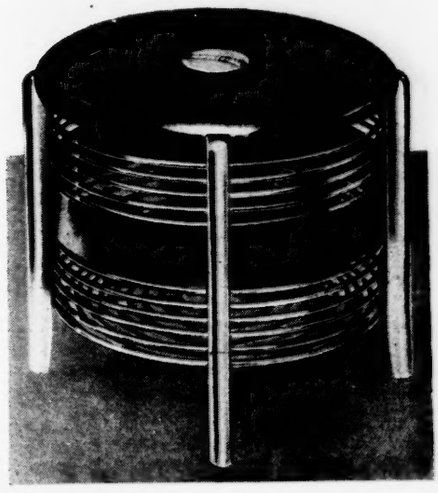
NAME — Meyer M-90-H gas-fired hi-boy.
PURPOSE—Space heating for the small home.



FEATURES—Furnace uses the company's new fountain type gas burner which incorporates an air shutter and venturi design that results, it is claimed, in high gas burner efficiency. Burner develops a flame pattern that fits the square shape of the main combustion drum so that the corners of the drum as well as the sides of the drum are heated to about the same temperature. Makers claim that the heating element is entirely free from any localized hot or cold spots. Heavy gage corner posts are used to strengthen the casing side sheets and also as a means of supporting the entire heating element and burner assembly. Unit comes standard with a side filter mount which can be cut into either side of the casing at the time of installation or, as an extra, either a casing type return air boot or filter base is also available. Furnace has been approved by the A.G.A. for all gases, including low pressure gas.
SIZES AND CAPACITIES—Output at bonnet, 72,000 Btu per hr.
MADE BY—*The Meyer Furnace Co., Peoria, Ill.* **240**

R & M Floor Fan

NAME—Robbins & Myers Breeze-All floor fan.
PURPOSE—Room ventilation.
FEATURES—A two-speed R & M motor is mounted on rubber cushions and is enclosed in an inverted cone-shaped motor housing to operate the 12-inch blade fan. The cone directs cooler floor air upward and outward. The induced air, which results from high velocities, is said to pull dead air from the corners of the room and to provide complete air circulation. At high speed, motor only requires 85 watts to operate the 4-blade fan. Closely spaced grille rings prevent personal injury.
MADE BY—*Robbins & Myers, Inc., Springfield, Ohio.* **241**



Williams Oil Burner

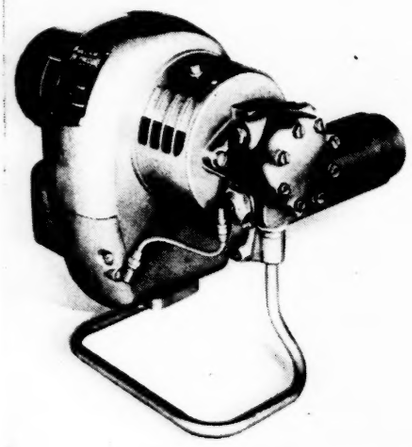
NAME—Model A Williams Hi-Pressure oil burner.

PURPOSE — For space heating requiring an oil burning rate from 1 to 2 gph.

FEATURES—Fan used is a 5-inch diameter wheel with individual blades riveted to back-plate and ring so that the full length of the blades are effective in the delivery of air. Entire fan is tinned to assure rigidity of blades. Fan housing, die-cast of aluminum, contains a generated scroll matched to the performance characteristics of the fan to provide even air delivery. Draft pipe is made of 16-gage seamless steel tubing. The split-phase motor that is used has built-in overload protection as well as built-in junction box. New type bearings are said to assure free starting after the summer shut-down period. Motor is completely enclosed in dust-proof housing. Design of the oil tube is said to insure the proper location of the nozzle with reference to the air cone.

SIZES AND CAPACITIES—As shipped, unit has a 3½-inch air cone for oil delivery from 1 to 2 gph. When a higher firing rate is desired, a 4-inch air cone is installed. Motor is 1/12 hp.

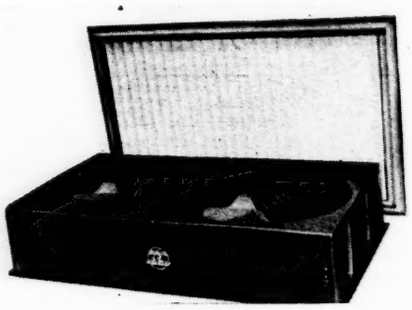
MADE BY—*Williams Oil-O-Matic Div., Eureka Williams Corp., Bloomington, Ill.* 242



Viking Attic Fan

NAME—Viking 722 attic fan package.

PURPOSE—For use in tourist courts, cottages and GI homes for building ventilation.



FEATURES — Package contains two 22-inch, 3-bladed fans with a NAFM rating of 6,200 cfm. Fans are operated by a 1/3 hp ball-bearing motor which supplies power through a single belt drive. Package includes, besides the fan and motor, automatic ceiling shutter, electric timer, safety fusible link, felt sealing strips, and resilient mounting. The timer is built into the fan casing to eliminate the installation of a wall switch leg. Hinged automatic ceiling shutters that can be lowered make it easy to clean and service the unit from the floor below.

MADE BY—*Viking Air Conditioning Corp., 5600 Walworth Ave., Cleveland 2, Ohio.* 243

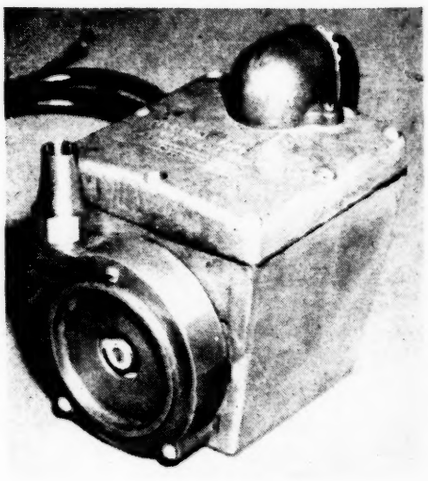
Little Giant Pump

NAME—Little Giant vaporizer pump.

PURPOSE—To provide a method of recirculating water on the evaporator pad of an evaporative cooler of the drip type.

FEATURES—Vaporizer breaks up the water into a fine vapor spray to saturate the pad. The only moving part is the rotor which is totally enclosed in a bath of oil. Unit, which is adaptable to any evaporative cooler, comes as a complete unit hermetically sealed against moisture. All exposed parts of the pump are of die-cast aluminum.

SIZES AND CAPACITIES—Available in three sizes to serve evaporator pad areas of 4, 12 and 25 sq ft. In the largest size a 1/30 hp motor operates at 3,050 rpm.



LITERATURE AVAILABLE—Bulletin.

MADE BY—*Little Giant Vaporizer Co., Inc., 5101 Classen Blvd., Box 3535, Oklahoma City, Okla.* 244

JUNE, 1949

TO OBTAIN FURTHER INFORMATION ON NEW EQUIPMENT

On the list below, circle the item number of the equipment in which you are interested, using the number found at the end of each item.

208	209	210	211	212	213	214	215
216	217	218	219	220	221	222	223
224	225	226	227	228	229	230	231
232	233	234	235	236	237	238	239
240	241	242	243	244			

Print your name and address, detach and mail to
Editor, HEATING AND VENTILATING, 148 Lafayette St., New York 13, N. Y.

Name.....

Title (Must be shown).....

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(For prompt service, title and firm name must be shown above.)

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Abstracts and Reviews

Publications abstracted in this department should be ordered direct from publisher.

TEMPERATURE AND HUMAN LIFE

The heating and ventilating engineer and others concerned with the effects of temperature on the human body may find material of considerable interest in the new book by Dr. C.-E. A. Winslow and Dr. L. P. Herrington of the John B. Pierce Laboratory.

While it covers a great deal regarding physiology, it is also a technical book in that it describes the experiments on human subjects that were conducted at the John B. Pierce Laboratory where the authors conducted their research. Numerous charts and equations are presented.

A large part of the material in the first seven chapters of the book has an important educational application in the fields of environmental physiology and physiological hygiene as the subjects are treated in relation to the general field of public health. The authors have made wide use of this material in graduate seminars conducted in the Department of Public Health at Yale University.

During the past war considerable interest developed in the adjustment of military personnel to extremes of cold and heat and on the physiology of clothing. Some of the major conclusions reached as the result of research are summarized.

Some of the chapters covered in the book are: Production of Heat in the Life Process; Avenues of Heat Loss from the Body; The Adaptations of the Human Body to Varying Thermal Conditions; Thermal Protective Influence of Clothing; Objectives of Air Conditioning; Methods of Air Conditioning; Influence of Climate and Season Upon Health; Man-made Climate of Interior Spaces.

Temperature and Human Life, by C.-E. A. Winslow and L. P. Herrington. Cloth bound, 5½ x 8½ inches, 272 pages. Published by Princeton University Press, Princeton, N. J. Price, $3.50.

WELDING METALLURGY

Back in 1940 the American Welding Society issued the first edition of Welding Metallurgy prepared by O. H. Henry, professor of metallurgical engineering, and G. E. Claussen, formerly adjunct professor of metallurgy at the Polytechnic Institute of Brooklyn. Since the publication of this original article great strides have been made in the application of welding, particularly during the war years. In the preparation of the second edition of this book, G. E. Linnert, senior research engineer, Armco Steel Corporation, has added about 150 pages of new material. As in the case of the first edition, steels or ferrous alloys are the center of most discussions.

A short bibliography has been added at the end of each chapter to suggest sources of additional information. In the back part of the book is a section containing questions based on each chapter of the book for the use of schools or for home study. Fundamentals of metallurgy are discussed in first chapters for the benefit of those having no previous knowledge of this science. In all, the subject matter has been divided into 15 chapters and an appendix. This book should prove of value to all engineers interested in welding metallurgy.

Welding Metallurgy, by O. H. Henry, G. E. Claussen and G. E. Linnert. Cloth bound, 5 x 8 inches, 505 pages. Published by the American Welding Society, 33 West 39th St., New York 18, N. Y. Price, $2.50.

PLANNING THE UNIVERSITY LIBRARY BUILDING

A group of members of the Cooperative Committee on Library Planning, an organization financed by the Rockefeller Foundation, has made possible the presentation of ideas of a nationwide group of librarians, architects and engineers. The problem of such planning is considered important in view of the fact that it has been estimated that $100 million will be spent on university and college library buildings planned for construction during the next few years.

The latest methods of air conditioning for such buildings are discussed, and consideration is given to windowless libraries and all-glass walls. This book provides a check list of all the matters to be considered by those planning to build or to improve a library.

The committee that was formed was the result of an invitation extended to the heads of fifteen colleges and universities in the United States by President H. W. Dodds of Princeton University.

W. Ward Powell, Jr., of Massachusetts Institute of Technology, was largely responsible for the chapter on air conditioning.

Anyone interested in the University library building will find much of value in the summary of discussions by librarians, architects and engineers.

Planning the University Library Building. Edited by John E. Burchard, Charles W. David and Julian P. Boyd. Cloth bound, 5¼ x 8½ inches, 145 pages. Published by Princeton University Press, Princeton, N. J. Price, $2.50.

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HOT WATER AND STEAM HEATING SYSTEMS—Compiled in a 108-page book are the papers that were presented at the first Short Course on Hot Water and Steam Heating Systems that was held at the Undergraduate Division, University of Illinois, Chicago,

September 9 to 11, 1947. This course was conducted by the Department of Mechanical Engineering and the extension division of the University in cooperation with the Institute of Boiler and Radiator Manufacturers. It was the intent of the sponsors to present information pertaining to the design and installation of hot water and steam heating systems for residences for the benefit of dealer-contractors, wholesalers, and manufacturers' representatives. In all, this publication contains eight technical papers by a number of engineering professors and engineers actively engaged in the heating field. Price, 50 cents, Circular No. 54. University of Illinois Engineering Experiment Station, Urbana, Illinois.

SMOKE AND DUST ISSUING FROM A STACK—Dr. J. M. Dalla Valle, Associate Professor of Chemical Engineering, School of Chemical Engineering, Georgia Institute of Technology, Atlanta, Ga., has published A Simplified Method for Computing the Concentration at Ground Level of Smoke and Dust Issuing From a Stack. This booklet contains formulas and charts necessary for working out design problems. A nomogram is included to simplify the work necessary for determining certain values normally worked out by formula. The author includes an illustrative example to show how to use the various curves and data presented in the booklet. Price, $1. For a copy write to the author at the address given.

CONCRETE FLOORS FOR BASEMENTLESS HOUSES—A 4-page circular, F4.3, issued by the Small Homes Council of the University of Illinois is of direct bearing in the design of basementless houses. Nine different types of standard concrete floor construction were tested and recommendations made. The circular covers the problem of making concrete floors warm and dry; how to build a good concrete floor on the ground; how to cure a cold floor; insulation for floors having panel heat; and estimating heat loss through concrete floors. Small Homes Council, Mumford House, University of Illinois, Urbana, Ill.

BOILER AUXILIARIES, 1948—A report of the Boiler Auxiliaries Subcommittee of the Prime Movers Committee, Edison Electric Institute on Boiler Auxiliaries, 1948, has been made available. It covers operating and design problems related to boiler auxiliaries which are of particular concern to operators of steam generating equipment together with descriptions of new developments. This report of 68 pages covers such details as coal flow from bunkers, pulverizer exhaust maintenance, superheat control, chimney design, and chimney maintenance. To nonmembers, price per copy, 75 cents. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.

STEEL HORIZONTAL FIREBOX HEATING BOILERS — Recommendation R157-37 of simplified practice recommendation covering steel horizontal firebox heating boilers has been approved as a revised standard and copies of this revision are available. First issued in 1937, this recommendation established for the first time a simplified and uniform list of ratings for steel heating boilers of the horizontal firebox type for commercial installations. The proposed revision was initiated by the Engineering Committee of the Steel Boiler Institute. The scope has now been enlarged to include ratings for residential steel boilers, oil-fired, in terms of steam and water radiation and Btu per hour. For a copy, write to the Commodity Standards Division, National Bureau of Standards, Washington 25, D. C.

WELDING TERMS AND DEFINITIONS—After four years of effort, the American Welding Society has issued Standard Welding Terms and Their Definitions in a 50-page paper bound book in which more than 500 terms are defined. Price, $1.00 per copy. American Welding Society, 33 W. 39th St., New York 18, N. Y.

COAL UTILIZATION — The papers presented at the Seventh Short Course in Coal Utilization that was held at the University of Illinois, September 17 to 19, 1946, are contained in a 192-page paper-bound book which is available as Circular Series No. 53. The course was prepared to present information pertaining to coal and its efficient utilization for the benefit of those engaged in mining, preparing, marketing and using coal, and for those manufacturing and distributing machinery for the preparation and utilization of coal. The course included twenty papers which covered a wide variety of subjects pertinent to this general subject. Price, $1.00. University of Illinois Engineering Experiment Station, Urbana, Ill.

FINISHES FOR ALUMINUM—Basic information on the various processes for applying surface finishes to aluminum is made available in a 124-page book on finishes for aluminum. It is a revision of a two-volume book that was published in 1946 and processes adapted to continuous production operations are separated from the finishes only partially adapted to mass production techniques. There are chapters on characteristics and properties of aluminum, cleaning treatments, mechanical finishes, chemical treatments, electrolytic oxide finishes, electroplated finishes, organic finishes, special purpose finishes, controls and tests. For a copy, write to Reynolds Metals Company, 2500 S. Third St., Louisville 1, Ky.

CHART OF WELDING PROCESSES—A set of five process charts has been published which lists all 37 welding processes in common use today. Process charts compare these processes on the basis of similarities and differences of 24 fundamental characteristics important in production welding. Price, 35 cents per set of five charts. American Welding Society, 33 West 39th St., New York 18, N. Y.

METALLURGY AND PIPING — So much research is being carried on in piping materials, that the Edison Electric Institute has felt that a report should be made of the research that is going on. In EEI Publication No. R-7, a report is presented of the Metallurgy and Piping Subcommittee of the Prime Movers Committee, Edison Electric Institute. This report of 64 pages covers statements on activities of various piping organizations, and by operating companies and manufacturers on high temperature piping, graphitization, and valve stem corrosion. Price to nonmembers, $1.50. Edison Electric Institute, 420 Lexington Ave., New York 17, N. Y.

NEWS OF THE MONTH

34-INCH GAS LINE

to tap Texas-New Mexico natural gas fields for San Francisco area as pipeline companies grow.

The Pacific Gas and Electric Company shortly will start construction of the largest-diameter pipeline in the world for high-pressure transmission of natural gas.

It will be 34 inches in diameter and 506 miles long, extending from Topock, on the California-Arizona border near Needles, to the P.G. and E. distributing station at Milpitas, Santa Clara County.

This record-breaking pipeline will be part of a 1600-mile system of large mains that will bring substantial quantities of natural gas to Northern and Central California from out-of-state fields, principally in Texas and New Mexico. Construction of the pipelines east of Topock—in Arizona, New Mexico and Texas—is the job of the El Paso Natural Gas Company of Texas, which will deliver the gas to the P.G. and E.

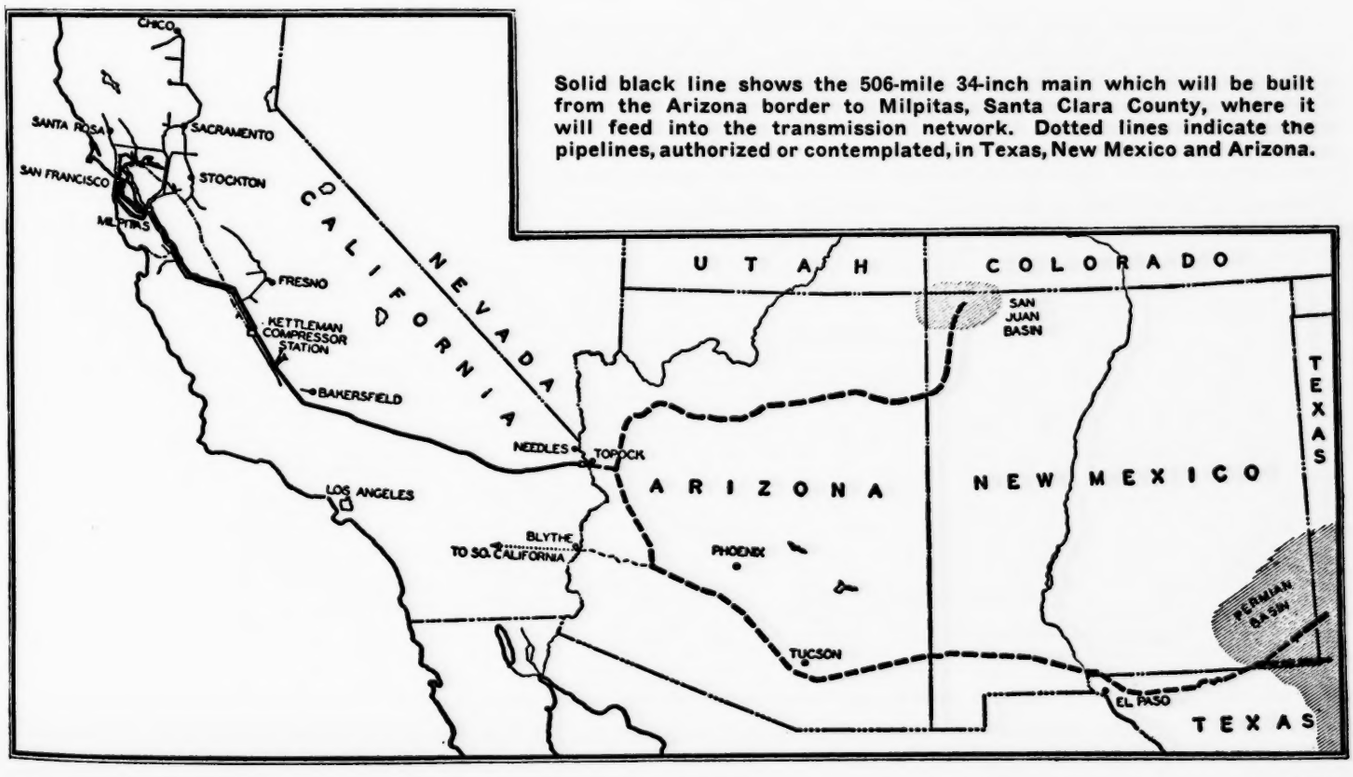
The entire project will cost both companies a total of approximately $150,000,000. The P.G. and E.'s 506-mile line—plus a large compressor station near Topock, another at Hinckley, San Bernardino County, and additional facilities at an existing compressor station at Kettleman Hills, Kings County—will cost $63,000,000.

Completion of the Topock-Milpitas pipeline is scheduled for midsummer of 1951, but the section from Topock to and beyond the Bakersfield area is expected to be finished and in operation by the first of that year, feeding gas into the southern units of the P.G. and E. network.

Authorizations to date provide for delivery to the P.G. and E. of 250 million cubic feet of gas per day from the Permian Basin in West Texas and Southern New Mexico—150 million daily beginning January 1, 1951, and 100 million more daily beginning January 1, 1952. Still pending are authorizations for an additional supply of 150 million cubic feet per day, which would bring the daily total to 400 million cubic feet. When this additional supply becomes available, the Hinckley compressor station will be built to increase the capacity of the P.G. and E. line accordingly.

On completion of the new pipeline, the principal delivery point will be the distribution station at Milpitas, where the gas will go into the P.G. and E.'s system of transmission lines serving the San Francisco Bay region and much of Northern and Central California. Laterals also will feed into the system at Bakersfield, the Kettleman Hills compressor station and Hollister.

New large-size equipment was designed and installed to fabricate the pipe, which will require 185,000 tons of steel. Each individual pipe will be 31 feet long by 34 inches in diameter and will weigh from 1½ to 2½ tons. These pipes must be trucked an average of 250 miles and some as far as the Arizona border. The trench for the main will be about 5½ feet deep by 3½ feet wide. Welding the pipes into a continuous line will necessitate a vast array of mobile apparatus. And there will be several other difficult tasks.



Solid black line shows the 506-mile 34-inch main which will be built from the Arizona border to Milpitas, Santa Clara County, where it will feed into the transmission network. Dotted lines indicate the pipelines, authorized or contemplated, in Texas, New Mexico and Arizona.

The work will be done as a joint venture by a contracting organization formed especially for the purpose by the Bechtel Corporation and R. A. Conyes of California, and H. C. Price of Oklahoma. The project will provide employment for between 250 and 300 men, not counting those engaged in fabricating the pipe and producing other essentials.

The Texas-Milpitas pipeline is the result of plans launched by the P.G. and E. in 1944 to obtain large supplies of out-of-state natural gas to offset the depletion of California's gas reserves. Use of natural gas in Northern and Central California has increased tremendously since the P.G. and E. substituted it for manufactured gas in 1929-1930. The company's gas sales jumped from 34½ billion cubic feet in 1932 to 59½ billion cubic feet in 1937, to 107 billion in 1942 and to approximately 163 billion in 1948. The average daily load last year was almost three times the average ten years ago and the load is expected to grow at the same rate for several years.

To keep ahead of this anticipated growth the P.G. and E. is expending $63,000,000 to bring in natural gas from Texas and New Mexico.

• Net income for Texas Gas Transmission Corporation amounted to $1,451,073 in 1948, an increase of 29% over the previous year. Gas sold during the year totaled over 50 billion cubic feet. The company received permission from the Federal Power Commission to build and operate a 26-inch natural gas pipe line that will stretch over 800 miles from the Texas and Louisiana gas fields to a connection with the Big Inch pipe line near Middletown, Ohio. Plans call for construction of a $73,500,000 line to be in operation later this year which will add approximately 400,000,000 cubic feet of gas daily to the present pipe line capacity of Texas Gas.

OIL HEAT EXPOSITION

and annual convention of Oil-Heat Institute of America held in Boston, Mass., May 16-20.

In a setting of record-breaking hot spring days, members of the Oil-Heat Institute of America and guests inspected the latest developments in the field of oil-heat displayed in the 130 exhibits, at Mechanics Hall, Boston, Mass., May 16 to 20. The entire National Oil Heat Exhibition and the twenty-sixth annual convention of the OHI that was held in conjunction with the show stressed the theme, "Oil Heat—Proved and Approved by Millions." About 5,000 persons in the industry visited the exhibition.

The OHI convention which was held at the Statler Hotel, Boston, was arranged to provide the afternoons free for those who wished to spend some time at the exposition.

• **NEW OFFICERS.**—A. T. Atwill, president, Quaker Manufacturing Co., Chicago, was elected president of the OHI. New vice presidents are C. S. Dieter, vice president, Bethlehem Foundry and Machine Co., Bethlehem, Pa., and J. W. Owens, executive vice president, Mercoid Corp., Chicago. New directors are H. W. Burritt, T. A. Crawford, W. F. Klockau, J. W. Oswald, H. A. Toker, J. H. B. Albert, S. G. Crate, R. D. Rankin, Sr., and G. H. Wolf, Jr. Paul Addams, president, Fitzgibbons Boiler Co., is the new chairman of the OHI Accessory Division, and Frederick C. Haab, Electrical Association, Philadelphia, chairman of the Distribution Division.

New Executive Committee of the OHI

Left to right, seated, R. S. Bohn, retiring president; Frederick C. Haab, newly elected chairman of the Distribution Division; A. T. Atwill, newly elected OHI president, and J. W. Owens, one of the two new vice presidents. Standing left to right, T. A. Crawford, D. G. Leslie, P. K. Addams, newly elected chairman of OHI Advisory Division, G. E. Hochstein and C. R. Collins.

• **SYNTHETIC FUEL.**—Dr. W. C. Schroeder, Chief, Bureau of Mines, Office of Synthetic Liquid Fuels, in his paper, "Heating Oils from Petroleum, Coal and Shale," described the Bureau's $60 million research program in synthetic fuels, and the pilot plants that are now turning out such products as gasoline and heating oils. Coal hydrogenation will produce separately or simultaneously, liquid fuels ranging all the way from high octane aviation gasoline to Bunker C fuel oil for industrial use. With synthetic plants, no new plant construction or additional raw materials is necessary when shifting from one product to another. Known reserves of raw materials are so large that they can meet all needs for a long time.

• **INDUSTRY PROBLEMS.**—W. A. Matheson, director, Eureka Williams Corp., and J. E. Horton, president, Horton Heating Corp., contributed to a symposium of industry problems as related to the manufacturer and distributor. Mr. Matheson said that oil burner salesmen last year averaged 59 burners per man compared with 68 for the previous year. He summarized the result of a survey he made among manufacturers in the domestic and industrial fields, covering such topics as the market of industrial equipment, operation under exclusive franchise dealers or distributors, dealers who also sell fuel oil, and the value of dealers selling a manufacturer's complete line.

Mr. Horton, who discussed problems at the distributor and dealer level, urged that better customer relations must be developed, for good customer relations promote sales. He said, "The best way to gain confidence is to first prove that we deserve it."

11,000 feet of Revere Copper Water Tube were used in the radiant panel heating system. The building has 9 zones, with each room controlled by individual thermostats. Revere Copper Water Tube was also used for hot and cold water lines, and Revere Sheet Copper for roofing.

...as the Manager of Reno's famed Harold's Club Builds a Magnificent New Home

IT'S always a safe bet—for radiant panel heating as well as for hot and cold water lines—that Revere Copper Water Tube will provide many long years of continuous service. This tube guards against leaks, rusty tap water, inadequate flow and faulty circulation. Yet, completely installed it costs little or no more in the first place . . . and may be much less in the long run.

All Revere Copper Water Tube is stamped at regular intervals with the Revere name and the type. These marks are more than identification —they are your assurance of full wall thickness and the close dimensional tolerances so essential for tight soldered joints.

Other Revere products include: Copper Water Tube for use with soldered fittings for hot and cold water lines and heating lines; Red-Brass Pipe; Sheet Copper and Herculoy for tanks, pans, ducts and trays; Panel Sheets in architectural bronze, nickel silver and copper; Extruded Shapes in architectural bronze, nickel silver and aluminum . . . and, of course, Sheet Copper for roofing, flashing and other sheet metal construction. They are handled by leading distributors in all parts of the country.

Raymond I. Smith residence, Reno, Nevada.
Architect: Gulling & Means; Plumbing, heating and sheet metal contractor: Charles Burke, Jr.; Revere Distributor: Acme Supply Co.—all of Reno, Nevada.

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COPPER AND BRASS INCORPORATED

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Mills: Baltimore, Md.; Chicago, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y.—Sales Offices in Principal Cities, Distributors Everywhere.

• **DEALER DAY.** — Dr. Courtney C. Brown of the Standard Oil Company of New Jersey in his paper on "Some Characteristics in Requirements of the Burning Oil Market" pointed out that there is a great need for the industry to store larger amounts of heating oil during the summer as a precautionary measure. He said that the burning oil market is potentially a much larger one than the gasoline market and that the industry must adjust its thinking to the desirability of regularly carrying larger light burning-oil stocks through the summer.

"Competition in Automatic Heating" was discussed by A. S. Kozman, manager, Cook's Oil Company, Oakland, Calif. He said that there is nothing new about the problem of gas competition. It is necessary to analyze the nature of the competition that the industry is up against, describe the tactics of the enemy, see the factors that operate favorably and unfavorably for gas and the factors that affect the oil heat industry favorably and adversely. What can be done about gas competition is undoubtedly the concern of everyone. It is necessary to stimulate thinking about what might be done and to help in some measure to arouse the united action that is required to meet gas competition.

D. A. Packard, household sales manager, Kelvinator Division, Nash-Kelvinator Corp., presented a paper on "The Art of Specialty Selling." In the appliance and heating field, he pointed out, many of the retailers represent a variety of manufacturers. The art of specialty selling reaches its peak in the sales organization that is directed by a man with definite ability. The job for rebuilding the specialty selling part of American sales power is primarily dependent on rebuilding an organization of specialty sales managers. Due to the lack of new training during the war years, the power of this sales group is well below the figure that it should be.

• **LOWER HEATING COSTS.**—Friday was devoted to architects and engineering day and included a forum discussion on "Lower Heating Cost—To Be Realized from Burners or Heat Absorbing Vessels." Speaking for vaporizing burning equipment was John B. Matis, chief engineer, Quaker Manufacturing Co. He said that while other types of burners are doing a fine job in homes requiring larger heating capacity, the vaporizing burning is directed primarily to those interested in low cost heating for the small homes. Properly installed and adjusted, service of such a burner will probably consist only of an annual routine check to clean and adjust the valve, strainer, and fuel lines.

Presenting the case of the pressure type burner in this symposium, Howard E. Earl, chief engineer, Williams Oil-O-Matic Division, Williams Eureka Corp., said that while progress has been relatively slow, each year the industry is advanced by developments to improve combustion information and to effect a reduction in fuel consumption. Constant effort is being made to simplify the design of burners and to provide greater ease of installation and service so that these betterments eventually result in lower oil heating costs.

Harold K. Ricker, sales engineer, Gilbert & Barker Manufacturing Co., discussed the subject of commercial and industrial oil burners. He pointed out that these types of burners can be grouped according to the means employed to break the oil into particles fine enough for burning, such as steam atomizing, air atomizing, aspiration or vacuum pressure atomizing, mechanical pressure atomizing and centrifugal or rotary atomizing. While the heat contained in No. 6 fuel oil averages 152,000 Btu per gallon, the heat contained in highest quality bituminous coal, he stated, is from 14,000 to 14,500 Btu per lb. Wherever No. 6 fuel oil is available, first consideration should be given to the importance of installing oil burner equipment capable of burning this type of fuel.

Research that is being carried on in the warm air field in order to achieve greater heating efficiency was described by Frank E. Merring, vice president in charge of sales, The Meyer Furnace Co. He touched on the research work carried on at the University of Illinois since 1918. These studies are coordinated with the research activities of the National Warm Air Heating and Air Conditioning Association. He told of the work that is going on in the industry to provide better heating at lower costs.

The case of cast iron and steel boilers was described by L. N. Hunter, vice president, National Radiator Co. He pointed out that the boiler manufacturer is but one person of many who can contribute towards reduced heating cost. While many improvements have been made in boilers during the last ten years, a great deal of development has been slowed up because of the war. Boiler reduction has not reached a zenith of perfection, but he said that boiler manufacturers have been contributing their share towards reduction in heating costs in systems which use boilers. Manufacturers are concerned about their ability to continue to sell properly rated and safely constructed boilers at a fair price.

Gerald W. Bohn, vice president, Preferred Utilities Manufacturing Corp., covered the subject of automatic unit steam generators. He said that the unit steam generator offers industry approximately the same low cost steam production that has been enjoyed by the large utilities and therefore that it represents the greatest advance in steam production in its field that has taken place during the past fifty years. Within the American Boiler and Affiliated Industries, there has been organized a group of manufacturers of packaged steam generators. This group meets regularly in an effort to popularize the original steam generating units and to develop and increase favorable reputation for automatic unit steam generators.

• **DESIGN PROGRESS.**—The final paper of the convention was presented by Henry Wright, architect and consulting engineer, New York City, who spoke on recent progress in heating and building design. In his paper, Mr. Wright covered such current topics as radiant heating, heating of the Lustron house, heating the basementless type house, heating insulation, solar heating and kindred topics. There is a need on the part

(Continued on page 120)

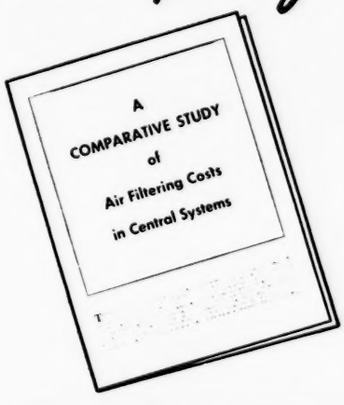
Even with today's labor rates

Chart adapted from The Conference Board's statistics

Air [illegible]

Ch[illegible]

Prove It Yourself



Write for your free copy of "A COMPARATIVE STUDY OF AIR FILTERING COSTS"

This concise study gives you the facts, provides a work sheet on which you insert your own figures. In a few minutes, you can prove which type of air filter is most economical for any central system. Write Owens-Corning Fiberglas Corporation, Dept. 912, Toledo 1, Ohio. In Canada: Fiberglas Canada Ltd., Toronto, Ont. Cable address: FIBERGLAS, Toledo, Ohio, U. S. A.

Air filtering costs have been climbing higher and higher . . . except where DUST-STOP Replacement-Type Filters are used. Efficient DUST-STOP Air Filters not only cost less to install, but eliminate the expensive labor of many maintenance operations. No manual cleaning required! No reoiling! No need for expensive equipment!

The cost of using DUST-STOP Filters, themselves, has come down, too. Wide use of 1″ filters has cut central system costs. And the rotation-replacement plan, using two or four 1″ filters per cell, has further slashed maintenance bills.

DUST STOP* **AIR FILTERS**

*T. M. REG. U. S. PAT. OFF.

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***DUST-STOP is the trade-mark of Owens-Corning Fiberglas Corporation for impingement-type air filters made of glass fibers. FIBERGLAS is the trade-mark (Reg. U. S. Pat. Off.) of Owens-Corning Fiberglas Corporation for a variety of products made of or with glass fibers.**

DEGREE-DAYS FOR APRIL, 1949

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

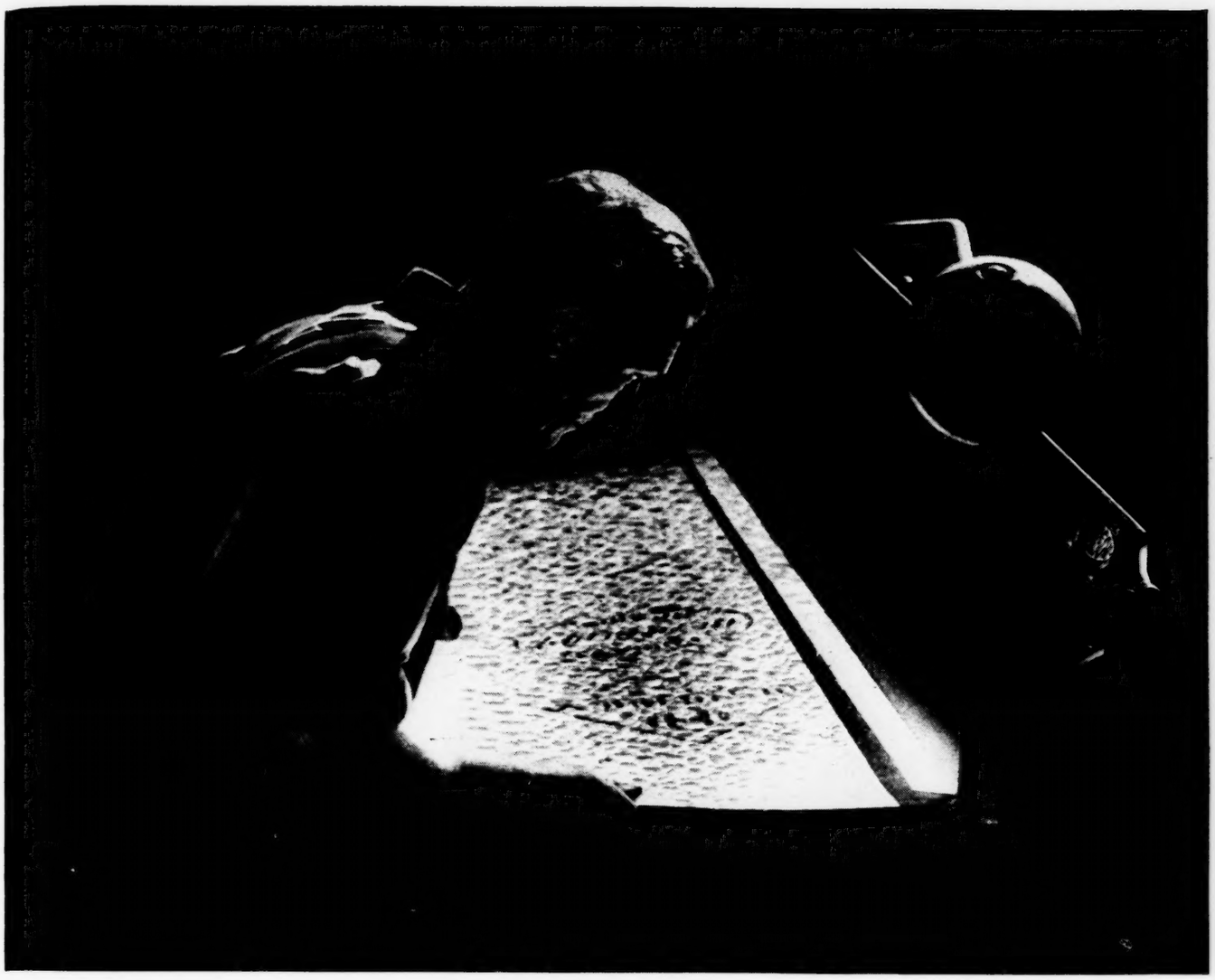
City	April			Cumulative, Sept. 1 to April 30			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Abilene, Texas (A)	188	38	27	2817	2840	2061	2061
Albany, New York (A)	494	543	549	5876	7108	6397	6580
Albuquerque, New Mexico (A)	299	185	288	4574	4540	4258	4298
Alpena, Michigan (C)	662	693	789	6623	7397	7662	8299*
Anaconda, Montana (C)	564	784	756	8227	7779	7493	8357**
Asheville, North Carolina (C)	322	170	330	3453	3823	4161	4232
Atlanta, Georgia (A)	180	61	132	2364	2821	2890	2890
Atlantic City, New Jersey (C)	408	480	519	3959	4843	4956	5176
Augusta, Georgia (C)	108	23	24	1619	2288	2161	2161
Baker, Oregon (C)	509	674	615	7303	6285	6519	7163
Baltimore, Maryland (C)	312	308	348	3591	4389	4511	4533
Billings, Montana (A)	362	511	534	7269	6710	6743	7119
Binghamton, New York (C)	530	485	594	5563	6422	6554	6808
Birmingham, Alabama (A)	164	69	69	2285	2755	2352	2352
Bismarck, North Dakota (A)	494	624	657	8811	8944	8809	9192
Block Island, Rhode Island (C)	537	623	633	4616	5565	5311	5788
Boise, Idaho (A)	349	507	435	6296	5662	5316	5552
Boston, Massachusetts (A)	423	511	570	4787	5849	5800	6045
Bozeman, Montana (C)	509	635	731	8012	7642	7724	8521**
Buffalo, New York (A)	583	487	675	5638	6325	6475	6822
Burlington, Iowa (A)	440	310	(a)	5955	6005	(a)	(a)
Burlington, Vermont (A)	596	635	654	6528	7721	7238	7514
Butte, Montana (C)	610	762	741	8757	8240	7424	8235**
Cairo, Illinois (C)	218	123	201	3431	3921	3909	3909
Canton, New York (C)	614	617	684	6720	7783	7686	8020
Charleston, South Carolina (C)	59	36	36	1165	1944	1769	1769
Charlotte, North Carolina (C)	200	98	159	2432	3165	3120	3120
Chattanooga, Tennessee (A)	217	86	144	2844	3212	3118	3118
Cheyenne, Wyoming (A)	611	608	720	7255	6986	6894	7466
Chicago, Illinois (C)	506	396	518	5358	5769	5764	6077
Cincinnati, Ohio (C)	342	224	333	3931	4481	4684	4684
Cleveland, Ohio (A)	526	398	564	5234	5782	5935	6155
Columbia, Missouri (C)	338	180	303	4740	4750	4900	4922
Columbia, South Carolina (C)	137	45	63	1760	2493	2364	2364
Columbus, Ohio (C)	429	306	420	4573	5133	5311	5398
Concord, New Hampshire (A)	556	635	669	6248	7489	7001	7353
Concordia, Kansas (C)	345	180	342	5688	5400	5250	5315
Dallas, Texas (A)	128	32	9	2473	2689	2256	2256
Davenport, Iowa (C)	427	313	453	5788	5973	6171	6289
Dayton, Ohio (A)	478	350	396	5041	5607	5183	5264
Deer Lodge, Montana (C)	558	692	735	8540	7588	7860	8672**
Denver, Colorado (C)	435	355	534	5701	5569	5607	5874
Des Moines, Iowa (C)	431	296	441	6223	6129	6266	6384
Detroit, Michigan (A)	534	426	573	5588	6224	6264	6490
Devils Lake, North Dakota (C)	592	841	756	9545	9803	9450	9970
Dodge City, Kansas (A)	371	173	342	5392	5271	4988	5035
Dubuque, Iowa (C)	471	336	489	6318	6450	6641	6790
Duluth, Minnesota (C)	620	720	801	8107	8876	8746	9483
Eastport, Maine (C)	672	812	786	6547	7436	7398	8520**
Elkins, West Virginia (A)	542	314	501	5047	5350	5520	5697
El Paso, Texas (A)	152	47	45	2930	2908	2428	2428
Ely, Nevada (A)	(a)	667	(a)	(a)	7240	(a)	(a)
Erie, Pennsylvania (C)	593	444	609	5148	5733	6016	6273
Escanaba, Michigan (C)	711	730	828	7213	7896	8118	8771
Evansville, Indiana (A)	345	257	276	4154	4658	4244	4244
Fort Smith, Arkansas (A)	185	60	93	3250	3416	3147	3147
Fort Wayne, Indiana (A)	514	406	474	5515	6141	5795	5925
Fort Worth, Texas (A)	124	34	27	2438	2716	2148	2148
Fresno, California (A)	39	173	135	2733	2544	2334	2334
Galveston, Texas (C)	60	7	0	993	1445	1016	1016
Grand Junction, Colorado (A)	331	364	384	6160	5871	5430	5548
Grand Rapids, Michigan (C)	507	422	534	5677	6169	6361	6535
Green Bay, Wisconsin (C)	(a)	554	600	(a)	7571	7503	7825
Greensboro, North Carolina (A)	288	174	210	3213	3804	3529	3529
Greenville, South Carolina (A)	221	91	195	2601	3145	3380	3380
Harrisburg, Pennsylvania (A)	420	386	405	4686	5332	5285	5375
Hartford, Connecticut (A)	445	515	531	5200	6324	5834	6036
Hatteras, North Carolina (C)	145	133	255	1874	2418	2571	2571
Havre, Montana (C)	398	638	630	8369	7522	8187	8700
Helena, Montana (A)	519	653	646	8512	7470	7261	7894**
Houston, Texas (C)	72	8	0	1196	1557	1157	1157
Huron, South Dakota (A)	488	424	570	7778	7913	7737	8004
Indianapolis, Indiana (A)	442	309	384	5018	5177	5239	5298
Jackson, Mississippi (A)	105	42	(a)	1805	2293	(a)	(a)
Kansas City, Missouri (A)	315	149	306	4847	4883	4950	4956
Knoxville, Tennessee (A)	260	105	210	3107	3402	3670	3670
La Crosse, Wisconsin (A)	545	444	528	7193	7562	7139	7322
Lander, Wyoming (A)	493	634	690	7998	7334	7384	7947

(a) Data not available.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Figures in this table, with seven exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston Me., respectively: Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company.

[Table concluded on page 114]



THESE COPPER-BEARING STEEL SHEETS

LAST CONSIDERABLY LONGER

(and cost very little more than ordinary galvanized sheets)

Heating or ventilating ducts made from Beth-Cu-Loy Galvanized Sheets can be expected to last longer than those made from plain galvanized steel sheets.

The principal reason for this long service is the resistance to rust provided by Beth-Cu-Loy's copper-bearing steel base. It is manufactured from open-hearth steel that contains 0.20 to 0.30 pct copper. In atmospheric-exposure tests by the American Society for Testing Materials this composition has proved to have more than double the resistance to corrosion found in ordinary open-hearth steel.

Aside from their lasting qualities, Beth-Cu-Loy Sheets are easy to form, to seam and to solder. They make fast work of difficult jobs. Their very slight additional cost is balanced many times over by their longer life and excellent workability.

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

Beth-Cu-Loy Galvanized Sheets

BETHLEHEM STEEL

Degree-Days for April, 1949 (Concluded)

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

HEATING AND VENTILATING's 21st Year of Publication of Monthly Degree-Day Data

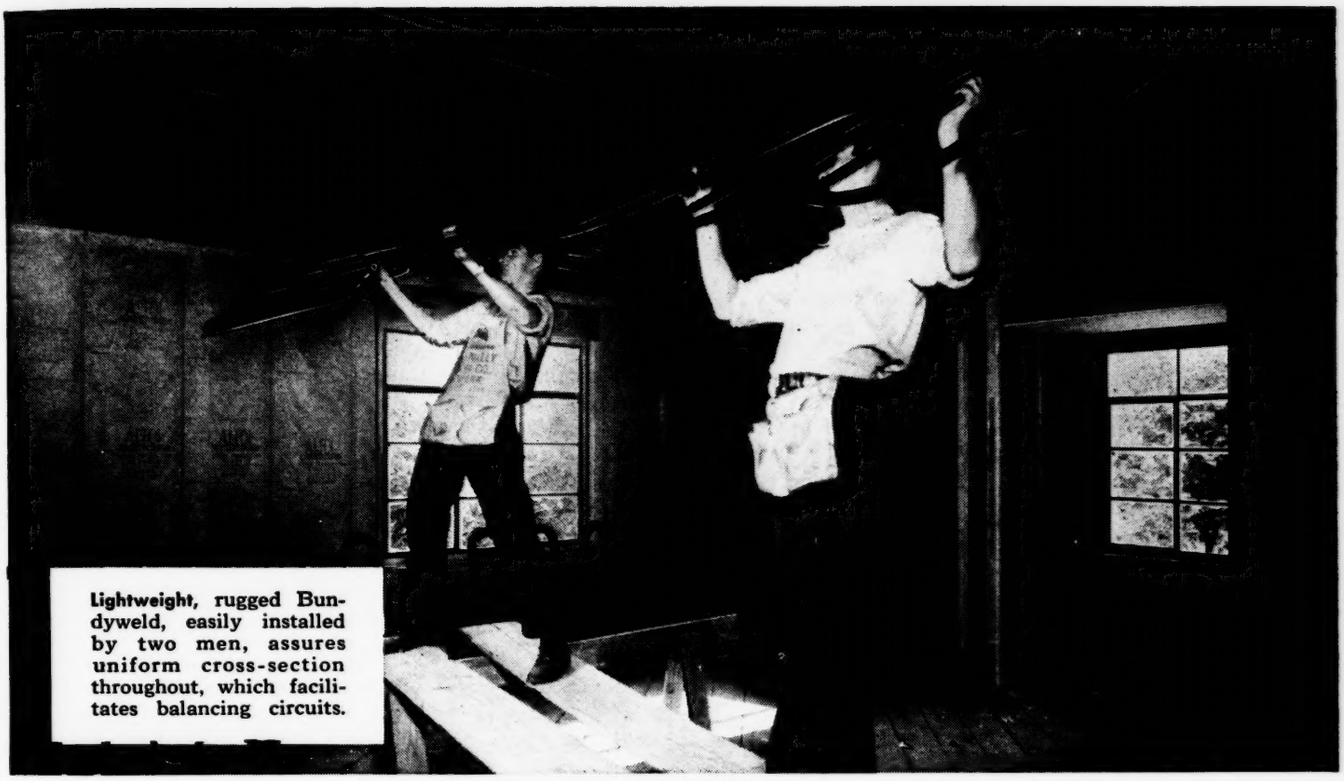
City	April			Cumulative, Sept. 1 to April 30			Heating Season[1]
	1949	1948	Normal	1948-49	1947-48	Normal	Normal
Lansing, Michigan (A)	563	453	582	6098	6677	6819	7048
Lewiston, Maine (O)	516	655	693	6171	7316	7318	7707
Lincoln, Nebraska (C)	358	239	417	6193	5891	5900	5999
Little Rock, Arkansas (A)	(a)	59	78	(a)	3214	2811	2811
Livingston, Montana (C)	443	613	653	7092	6970	6638	7245**
Los Angeles, California (C)	85	170	159	1784	1456	1414	1504
Louisville, Kentucky (A)	327	213	264	3892	4285	4180	4180
Lynchburg, Virginia (A)	324	236	273	3598	4201	3980	3980
Macon, Georgia (C)	94	31	33	1769	2334	2201	2201
Madison, Wisconsin (C)	560	431	582	6669	7122	7193	7429
Marquette, Michigan (C)	641	667	804	7189	7758	7968	8693*
Memphis, Tennessee (A)	171	92	96	2808	3355	2950	2950
Meridian, Mississippi (C)	112	42	24	1822	2332	2160	2160
Milwaukee, Wisconsin (A)	606	494	648	6356	6754	6856	7245
Minneapolis, Minnesota (A)	539	454	570	7449	7780	7614	7850
Montgomery, Alabama (C)	89	22	0	1509	2016	1884	1884
Nantucket, Massachusetts (A)	565	643	639	4933	5764	5450	5957
Nashville, Tennessee (A)	257	126	180	3210	3637	3507	3507
New Haven, Connecticut (A)	467	566	543	4931	6055	5672	5895
New Orleans, Louisiana (C)	37	39	0	900	1402	1024	1024
New York, New York (C)	356	449	465	4100	5148	5073	5274***
Nome, Alaska† (A)	1463	1843	1756	(a)	10855	10642	14580**
Norfolk, Virginia (C)	206	216	246	2511	3310	3350	3350
North Head, Washington (C)	486	573	516	4641	4227	4271	5452**
North Platte, Nebraska (C)	458	274	486	6619	5917	6167	6366
Oakland, California (A)	233	343	273	3091	2885	2665	3143**
Oklahoma City, Oklahoma (C)	204	57	162	3691	3778	3613	3613
Omaha, Nebraska (A)	374	263	414	6277	6094	6047	6131
Oswego, New York (C)	606	540	675	5781	6545	6668	7088
Parkersburg, W. Virginia (C)	391	232	351	4186	4615	4722	4775
Peoria, Illinois (A)	434	330	453	5621	5832	5988	6109
Philadelphia, Pennsylvania (C)	335	370	378	3872	4779	4605	4737***
Phoenix, Arizona (C)	36	18	0	1818	1651	1405	1405
Pittsburgh, Pennsylvania (C)	423	339	423	4388	5257	5157	5235
Pocatello, Idaho (A)	416	600	567	7143	6591	6263	6655
Portland, Maine (A)	585	707	666	6296	7205	6771	7218
Portland, Oregon (C)	307	462	402	4377	3889	4134	4469
Providence, Rhode Island (C)	386	461	558	4602	5648	5764	6015
Pueblo, Colorado (A)	411	309	456	5655	5840	5328	5514
Raleigh, North Carolina (C)	211	138	183	2579	3353	3234	3234
Rapid City, South Dakota (A)	459	483	594	7339	6745	6744	7118
Reading, Pennsylvania (C)	371	385	417	4325	5136	5293	5389
Red Bluff, California (A)	55	353	(a)	2972	2945	(a)	(a)
Reno, Nevada (A)	403	622	534	6304	5798	5436	5892
Richmond, Virginia (C)	265	227	246	3093	3880	3695	3695
Rochester, New York (A)	570	489	618	5783	6492	6472	6732
Roseburg, Oregon (C)	309	509	411	4319	4057	4047	4428
Roswell, New Mexico (A)	238	111	180	3853	3927	3484	3484
Sacramento, California (C)	97	308	207	2907	2832	2600	2653
St. Joseph, Missouri (A)	344	196	342	5439	5385	5145	5161
St. Louis, Missouri (C)	321	204	276	4287	4557	4585	4585
Salt Lake City, Utah (A)	349	461	453	6482	5745	5319	5555
San Antonio, Texas (A)	96	20	0	1626	1859	1202	1202
San Diego, California (A)	117	138	174	1826	1526	1524	1645
Sandusky, Ohio (C)	523	390	726	5118	5735	6025	6208
San Francisco, California (C)	280	343	294	2786	2454	2417	3264**
Sault Ste. Marie, Michigan (A)	748	749	819	7741	8372	8448	9285**
Savannah, Georgia (A)	53	19	0	1097	1729	1490	1490
Scranton, Pennsylvania (C)	471	460	513	5187	6024	5958	6129
Seattle, Washington (C)	396	511	462	4598	4165	4379	4934**
Sheridan, Wyoming (A)	451	553	648	7582	7094	7485	8008
Shreveport, Louisiana (A)	110	25	0	2029	2452	1938	1938
Sioux City, Iowa (A)	450	331	489	7121	6717	6734	6898
Spokane, Washington (A)	474	646	504	7180	6348	5989	6355
Springfield, Illinois (C)	373	250	366	4876	5068	5317	5373
Springfield, Missouri (A)	325	165	267	4453	4585	4416	4428
Syracuse, New York (A)	547	495	630	5753	6697	6614	6893
Tacoma, Washington (C)	417	540	465	4895	4507	4551	5181**
Terre Haute, Indiana (A)	403	303	333	4843	5313	4872	4872
Toledo, Ohio (A)	536	406	525	5534	6192	5897	6077
Topeka, Kansas (C)	314	143	300	4992	4982	4935	4969
Trenton, New Jersey (C)	365	409	402	4237	5165	4852	4933
Utica, New York (O)	494	482	588	5459	6910	6543	6796
Valentine, Nebraska (C)	478	391	561	7217	6718	6766	7039
Walla Walla, Washington (C)	254	438	363	5372	4703	4637	4808
Washington, D. C. (C)	297	265	348	3569	4291	4601	4626
Wichita, Kansas (A)	293	120	252	4838	4681	4673	4673
Williston, North Dakota (C)	460	694	669	8847	8640	8907	9323
Winnemucca, Nevada (C)	391	581	539	6632	5986	5950	6427**
Yakima, Washington (A)	382	525	360	6347	5558	5413	5599

(a) Data not available.
†Nome data are for March.

*Includes August.
**Includes July and August.
***New 48-year normal covering 1898 to 1946.

[1]Figures in this column are normal totals for a complete heating season, September to June, incl.

Better radiant heating at lower cost with BUNDYWELD



Lightweight, rugged Bundyweld, easily installed by two men, assures uniform cross-section throughout, which facilitates balancing circuits.

Top performance in any radiant heating installation. Savings in time, money and labor.

That's what Bundyweld* Steel Tubing has to offer.

For Bundyweld, made by a patented process, has important qualities not found in any other tubing. Double-walled from a single strip, copper-coated or tinned, it has extra-strong yet thin walls that afford maximum heat conductivity.

It is ductile and easily bent, yet still has the ruggedness to withstand the denting and crushing normally encountered in using softer materials.

Bundyweld can be supplied with one end expanded, and is readily soft-soldered or silver-brazed. Total installation costs are considerably reduced through the use of this unique tubing.

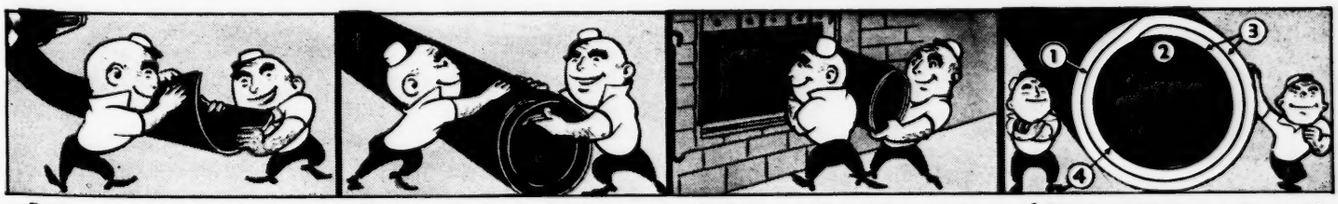
Available immediately, low-cost Bundyweld comes in 20-foot lengths in sizes up to ⅝" O.D. and wall thicknesses up to .049". For information, write to: *Bundy Tubing Company, Detroit 14, Michigan.*

BUNDY TUBING

ENGINEERED TO YOUR EXPECTATIONS

*REG. U. S. PAT. OFF. ®

WHY BUNDYWELD IS BETTER TUBING



1 Bundyweld Tubing, made by a patented process, is entirely different from any other tubing. It starts as a single strip of basic metal, coated with a bonding metal.

2 This strip is continuously rolled twice laterally into tubular form. Walls of uniform thickness and concentricity are assured by close-tolerance, cold-rolled strip.

3 Next, a heating process fuses bonding metal to basic metal. Cooled, the double walls have become a strong ductile tube, free from scale, held to close dimensions.

4 Bundyweld comes in standard sizes up to ⅝" O.D., in steel (copper or tin coated), Monel or nickel. For tubing of other sizes or metals, call or write Bundy.

NEW CATALOGS

Ammonia Condenser

Catalog No. 21-C, 16 pages, 2 colors, describes the Acme ammonia shell and tube condenser with tables of dimensions, capacity ratings and selection graphs. Both horizontal and vertical condensers are described. —*Acme Industries, Inc., Jackson, Mich.* 106

Government Procurement Brochure

Short cuts to successful bidding and execution of government contracts are outlined in a U. S. Government Procurement brochure edited by Trilane Associates. Chapters include discussions of common misconceptions regarding the difficulty of obtaining government contracts, common difficulties experienced by procurement officers, terms of payment, etc. The brochure has been edited from the suppliers' point of view.—*Trilane Associates, 1 Hudson St., New York 13, N. Y.* 107

Air Filtering Costs

A Comparative Study of Air Filtering Costs in Central Systems is a 4-page folder containing data on the costs of air filtration, with comparative figures on installation and maintenance costs of cleanable units and replacement-type air filters. A form is included for use by the specification writer and others, in calculating comparative costs for a specific installation.—*Owens-Corning Fiberglas, Toledo 1, Ohio.* 108

Controls for Schools

Fuel saving instruments and other devices for the automatic control of school environment are the subject of a non-technical booklet describing control systems for schoolhouse heating, ventilation, water temperature, refrigeration and boiler rooms.—*Minneapolis-Honeywell Regulator Company, Minneapolis 8, Minn.* 109

Burnham Heating Equipment

A 28-page, 2-color revised edition of the Burnham catalog of boilers, radiators and base ray radiant baseboards includes a new addition to the line, the Pacemaker boiler for home heating with oil. —*Burnham Corp., Boiler Div., Irvington, N. Y.* 110

Foamglas for Houses

Technical data, photographs and charts are used in a new brochure to introduce cellular glass insulation, P.C. Foamglas, to the residential field. Wall, floor, and roof insulating techniques are described.—*Pittsburgh Corning Corp., 307 Fourth Avenue, Pittsburgh 22, Pa.* 111

Mercury Relays

A 4-page folder describes mercury plunger relays. Diagrams show operating principles and dimensions. Two- or three-pulley units are described. — *Ebert Engineering & Manufacturing Co., 185-09 Jamaica Ave., Hollis 7, L. I., N. Y.* 112

Gas Welding Supplies

A 16-page catalog describes a complete line of gas welding supplies, including welding rods, fluxes, and silver brazing alloys. Mechanical properties of various products are described and application data are included.—*Air Reduction Sales Co., 60 E. 42nd St., New York 17, N. Y.* 113

Attic Ventilation Code

A standard size folder covers the essentials of installation of attic fans. This, the second edition of the code, has been rewritten to include new material such as illustrations of typical discharge openings, method of computing areas for attic fan discharge vents, and a map showing minimum air changes recommended for all parts of the United States.—*Propeller Fan Manufacturers' Association, 2157 Guardian Building, Detroit 26, Mich.* 114

Steam Specialties

Catalog No. 68A, 33 pages, 2 colors, describes Strong steam specialties, including traps, strainers, reducing valves, and separators. Descriptions include complete specifications and recommendations for use in typical applications. Prices are given on all items.—*Strong, Carlisle & Hammond Co., 1392-1394 W. Third St., Cleveland 13, Ohio.* 115

Single Phase Motors

The repulsion start induction brush lifting single phase motors from ½ to 20 hp are described and illustrated with cutaway drawings, tables, and performance graphs in an 8-page, 2-color bulletin.—*Century Electric Co., St. Louis 3, Mo.* 116

Valves

Catalog No. 99 describes and illustrates packless and packed valves, relief and check valves, strainers, dryers and liquid level gages for refrigeration, air conditioning and industrial applications. Sizes, prices, and dimensions are tabulated for each product.—*Henry Valve Company, 3215 W. North Ave., Melrose Park, Ill.* 117

Expansion Joints

CMH expansion joints are described and illustrated in Bulletin EJ-49, including engineering and product information for applications in industrial piping where pressure and temperature extremes exist. — *Chicago Metal Hose Corporation, Maywood, Ill.* 118

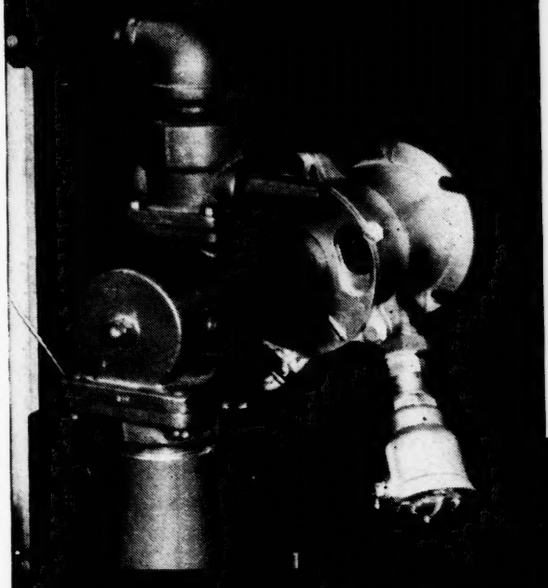
Synchronous Motors

Bracket bearing type AB synchronous motors in sizes from 30 to 1000 hp are described in a 16-page bulletin. Motors with special features are available including those with grease lubricated antifriction bearings, enclosed collector assemblies, enclosed, splash proof, etc. Included is a table of the sizes to which bearing pressures limit the application of two-bearing motors.—*Allis-Chalmers Manufacturing Co., 1172 S. 70th St., Milwaukee, Wis.* 119

Bryant Industrial

MIXJECTOR BLAST

TORCH BURNERS



COMPLETE GAS FIRING ASSEMBLIES FOR FURNACES, BOILERS AND KILNS

Mixjector Torches provide two big features: Specially-developed nozzle designed to hold flame tightly at all pressures, plus the Bryant Mixjector, most compact proportional mixer ever designed. Available in 9 sizes, capacities to 6,750,000 Btu per hour with 16-ounce air. *Write for Data Sheet 2C-1 for complete description.*

BRYANT INDUSTRIAL DIVISION
Affiliated Gas Equipment, Inc.
1020 LONDON ROAD • CLEVELAND 10, OHIO

SPECIFY alliance motors for your FANS

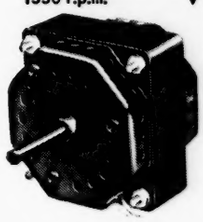
Mass production for mass markets —that's why Alliance is the best source for low cost, small load motors.

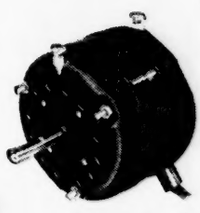
Alliance Motors have these outstanding advantages:

Low operating cost **Cool running**
Low induced hum **Flexible power range**
Low magnetic field **Slower controlled speeds**

Alliance builds 4-pole and 6-pole shaded pole induction motors with speeds from 500 to 1550 rpm and from 1/100 h.p. up to 1/25th h.p. Smaller 2-pole shaded pole motors will supply as little as 1/400 h.p.

MODEL B
4-pole shaded pole motor. Approx. 1/30 h.p. 1550 r.p.m.

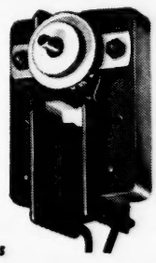




MODEL A
6-pole shaded pole motor. Approx. 1/30 h.p. 500 to 1050 r.p.m.

MODEL MS
2-pole shaded pole motor — full load h.p. .0021. Full load 2800 r.p.m.

Typical Fan Motor Uses
- Air Circulators
- Room Heaters
- Exhaust Fans
- Coolers
- Air Conditioners
- Unit Heaters
- Hair Dryers
- Controls



Write for catalog and specifications

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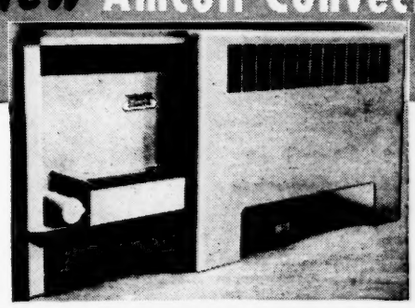
HOTTEST THING IN HEATING! THE *New* Amcoil Convectors



20" high recessed model. Also available is 21" high free standing model. Overall lengths range from 20" to 64".

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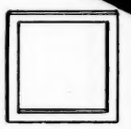

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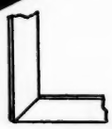

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Insulation Data Manual

A 96-page manual on 85% Magnesia insulation, illustrated with line drawings and photographs will be available in July to those having a direct interest in industrial heat insulation. Among the subjects covered are: properties of 85% Magnesia, determination of correct thicknesses, application and finishing procedures, and insulation maintenance. The appendix contains a discussion of practical applications of heat transmission theory, definitions of technical terms, 15 tables of data on 85% Magnesia and related subjects, a glossary of trade terms, and a list of trade names of the insulating material and accessory products.—*The Magnesia Insulation Manufacturers Association, 1317 F St., N.W., Washington 4, D. C.* 120

Air Diffuser Selection

A 6-page bulletin contains data for selection and sizing of the Agitair line of square or rectangular diffusers. Diagrams, tables and distribution graphs are included.—*Air Devices, Inc., 17 E. 42nd St., New York 17, N. Y.* 121

Vibration Control

Typical installations in which cork may be satisfactorily used to control transmission of vibration and noise, installation data and information on specification writing are offered in Bulletin C-1.—*The Korfund Co., Inc., 48-01 E. Thirty-Second Place, Long Island City 1, N. Y.* 122

Water Hose

A 4-page catalog section on water hose for use in a wide variety of services describes and illustrates construction of each type of hose, lists recommended uses and gives detailed specifications together with coupling information.—*The B. F. Goodrich Co., Akron, Ohio.* 123

Cast Iron Convectors

How cast iron convectors concealed by sheet steel enclosures produce both convected and radiant heat is explained and illustrated in Bulletin No. 540, 8 pages, 3 colors. Bulletin pictures National Aero convectors for one-pipe steam, hot water, vapor and vacuum heating systems.—*The National Radiator Co., Johnstown, Pa.* 124

JUNE, 1949

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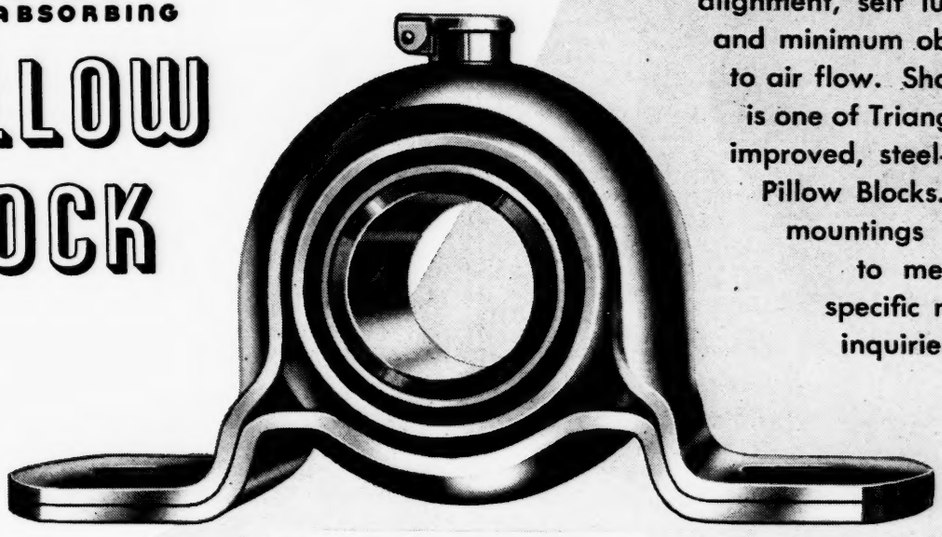

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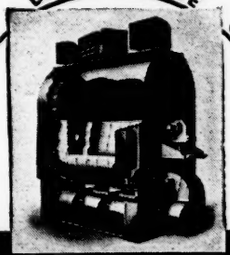

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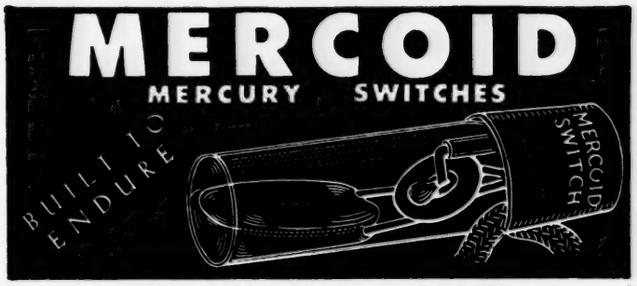

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OIL HEAT EXPOSITION

(Concluded from page 110)

of the heating industry, he stated, for an increased awareness of architectural trends and building requirements; a need on the part of the building designer for a better understanding of the technical principles that are the foundation of his work. He warned that the bulk of business would go to those firms who anticipate the design trend towards integration and who do something about it.

ANTHRACITE CONFERENCE

at Lehigh University covers progress in mining and distribution.

Current progress in anthracite and anthracite equipment and future industry and technical trends were featured at the seventh annual anthracite conference at Lehigh University May 5 and 6. The conference is sponsored jointly by the University and Anthracite Institute. Papers by leading engineers, educators, and members of the producing and retailing industry covered new mining and preparation equipment and progress in utilization and merchandising of anthracite.

• **USING SILT.**—Approximately 1.3 billion tons of anthracite silt have accumulated at collieries as a noncommercial by-product since 1926. Dr. R. C. Johnson, vice president for research, Anthracite Institute, told the conference that recent developments in gasification techniques have opened up the possibility of producing low cost gas from anthracite silt. The anthracite industry is currently producing about 6 million tons annually and has in storage over 150 million tons of anthracite silt, which is a potential fuel for the production of synthetic liquid fuels and chemicals.

• **HOUSE HEATING.**—Home owners can have any degree of automatic heat they may desire with a maximum of safety, cleanliness, convenience and comfort by careful planning and with the use of modern anthracite equipment, according to Rudard A. Jones, research associate professor of architecture at the University of Illinois. Mr. Jones urged home owners to consult with architects who will play an important part in the consumer satisfaction attitude of the users of solid fuels. Speculative builders are more concerned with the first cost of equipment than with savings in fuel over long periods of operation. New anthracite equipment, while higher in first cost, has been shown to effect economies over long periods.

• **NEW USES.**—John D. Jillson, secretary of the Anthracite Institute, stated that the outlook for the anthracite industry for the coal year of 1949-1950 is good when he discussed factors affecting anthracite demand. New automatic anthracite equipment, some of which was presented in 1948, and some of which will be available for the first time in 1949, should be particularly helpful in promoting the sale of anthracite for new homes, said Mr. Jillson.

Future designs of automatic anthracite equipment were discussed by J. H. Simpson, vice president, Electric Furnace-Man, Inc. Mr. Simpson emphasized that with present development of stokers, and more espe-

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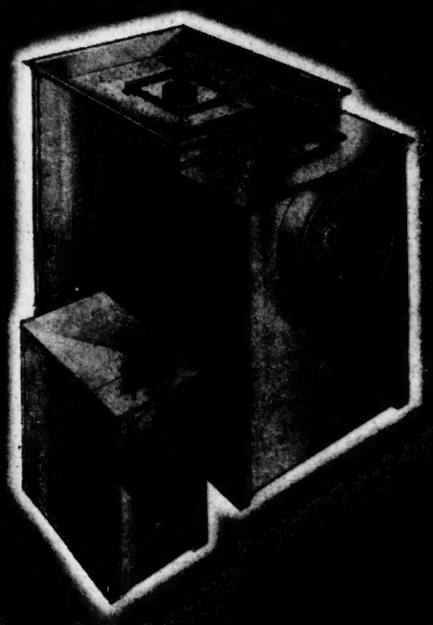

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"The reverse is also true, a foil insulated structure will tend to heat quicker than one insulated with ordinary insulation."

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cially the anthratube, the burden of future development now lies with the sales forces active in the anthracite industry.

• **INDUSTRIAL.**—L. N. Burnside and A. A. Norrman, presented a paper on the industrial utilization of rice anthracite and pointed out that the handling of stoker fired fuels may be considerably simplified with resulting economies if mixtures of rice coal in quantities from 20 to 50% are used to condition the fuel bed. Such mixtures tend to eliminate smoke and to break up the large coke trees which form when high volatile caking coals are used without specially design equipment.

• **STOKERS.**—Stoker firing of anthracite in small industrial plants was the subject of a paper by William Stein, Combustion Engineering-Superheater, Inc. The anthracite burning underfeed stoker was developed, said Mr. Stein, to fill the gap between the practical limit of the domestic stoker and the economic limit of the traveling grate stoker. Mr. Stein showed pictures of various underfeed and recently developed smaller size of traveling grate stokers and presented tables of test results.

Other papers presented before the 400 attending the conference included discussions of coal preparation, mechanical mining, utilization, and distribution sales.

SUMMER MEETING

of heating and ventilating engineers to be held at Minneapolis.

Physiological reactions will be the theme of one session at the summer meeting of the American Society of Heating and Ventilating Engineers at the Nicollet Hotel, Minneapolis, Minn., June 19 to 22. Another session will feature panel heating and the heat pump, while a third session will cover air handling techniques.

Social functions will include a ladies' luncheon and card party, golf tournament, tours of nearby lakes both by automobile and motor launch, style show, banquet and dancing.

Technical program of the meeting is as follows:

Monday, June 20

10:00 a.m.—Technical Session

Determining Performance of a Blower Used with a Furnace, by N. A. Buckley and R. W. Roose.

Air Streams from Perforated Panels, by Alfred Koestel, Philip Herman and G. L. Tuve.

Pressure Loss and Air Flow Characteristics of a Box Plenum, by S. F. Gilman, R. J. Martin, W. R. Hedrick and S. Konzo.

Tuesday, June 21

9:30 a.m.—Technical Session

Earth as a Heat Source or Storage Medium for the Heat Pump, by E. W. Guernsey, P. L. Betz and N. H. Skau.

Heat Pump Results in Equitable Building, by J. D. Kroeker, R. C. Chewning and C. E. Graham.

Ground Temperatures as Affected by Weather Conditions, by A. B. Algren.

Wednesday, June 22

9:30 a.m.—Technical Session

Permeance Measurement Improved by Special Cell, by F. A. Joy and E. R. Queer.

Human Tolerance Limits for Extreme Heat, by W. V. Blockley and Craig L. Taylor.

Heat Gains Are Not Cooling Loads, by C. O. Mackey and N. R. Gay.

Solar Energy Transmittance of 8-in. Hollow Glass Block, by G. V. Parmelee and W. W. Aubele.

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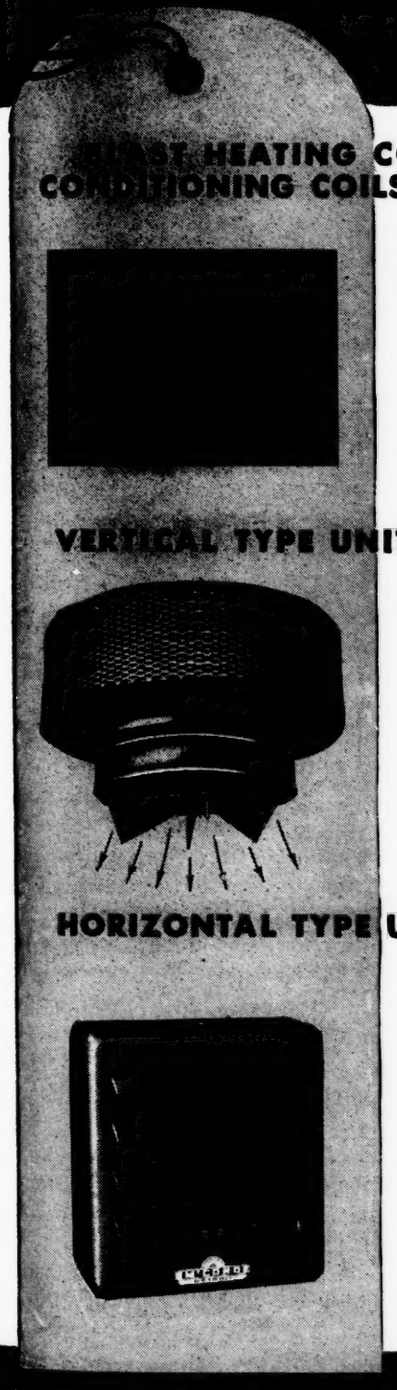

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A proven heating unit, modern in design, incorporating every unit heater advancement. McCord copper spiral fin tube construction creates air turbulence without undue restriction. Improved fan blades deliver large volume of air with minimum air noise. Guaranteed for 150 lbs. saturated steam pressure. Specify McCord.

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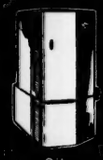
Commercial Stokers

Domestic Stokers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WHAT READERS SAY

Plaster and Radiant Heating

EDITOR, HEATING AND VENTILATING:

I am very much interested in the question of radiant heating and have designed several installations in this vicinity. However, I was recently told that the plaster in ceilings undergoes a chemical change at about 100F and that consequently in years to come there may be trouble with radiant panels in ceilings which are plastered. Is this correct?

Philadelphia, Pa. *S. C.*

Gypsum plaster will undergo a chemical change at the temperature mentioned but, depending on the humidity of the surrounding area, on the length of time the condition exists, and air movements over the material, the actual rate of chemical change will vary from an infinitesimally small amount to an amount that, while still small, is enough to consider. However, in conjunction with radiant heating systems in which various heating elements might be buried in gypsum plaster, this temperature is not felt to be the dividing line.

The Gypsum Association in cooperation with the various member companies have considered the matter of radiant heating systems insofar as they affect gypsum plaster and other gypsum products in various type installations over a period of several years. This has involved the inspection of innumerable installations either during installation or later during operation, the running of several series of tests, the observation of tests run by other groups, and many conferences with others interested in the general field of radiant heating. As a result, several recommendations were developed which are our answer to the question of "What effect does radiant heating systems have on gypsum plaster?" These recommendations are as follows:

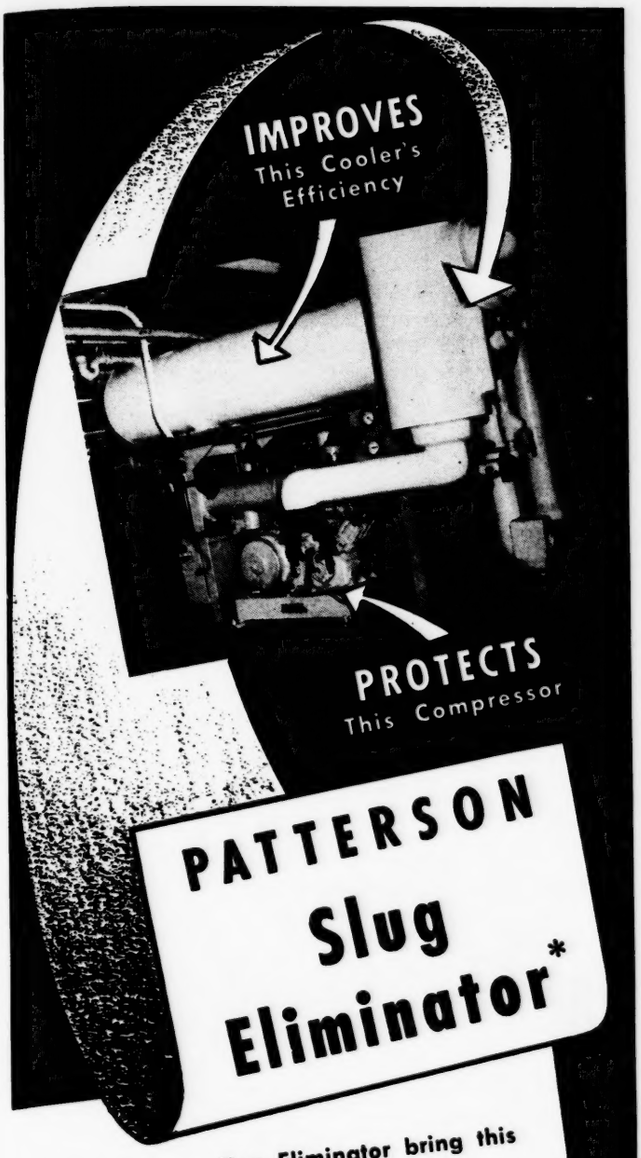
(1) In all radiant panel heating systems where gypsum plaster or gypsum products are concerned, the surface temperature shall not exceed 115F. In those systems where pipes are embedded in gypsum plaster, this shall be met by requiring the water temperature in the pipes in contact with the plaster not to exceed 125F. (Note: This is in agreement with the maximum surface temperatures listed in the ASHVE Guide which have been established from a comfort standpoint).

(2) The temperature of the gypsum plaster shall not exceed 90F or atmospheric temperature, whichever is greater, until the plaster has set and is thoroughly dry.

(3) Where heating elements are embedded in gypsum plaster, a minimum cover of $\frac{3}{8}$ inch shall be maintained.

(4) In radiant panel heating systems where the pipes are to be embedded in plaster applied to metal lath or gypsum lath, these pipes shall be supported by the framing and not by the lath alone.

(5) Gypsum plaster, when used with radiant panel heating systems, shall be mixed and applied in ac-



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In improving the efficiency of the cooler (1) it permits safe operation with partial flooding; (2) it subcools the refrigerant on its way to the cooler; (3) it prevents oil logging the cooler.

Thus, with this one single compact unit, those in charge of operations at the Hoffmann-LaRoche, Inc., plant in Nutley, N. J. are being benefited in two ways. This Patterson Slug Eliminator probably would be helpful to you, too. In sending for literature, write us in detail about your refrigerating or cooling system.

*The Patterson Slug Eliminator is protected by U.S. Patent No. 2461342.

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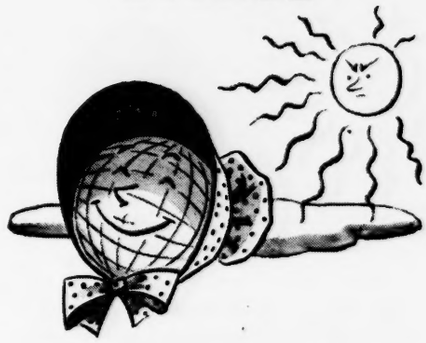

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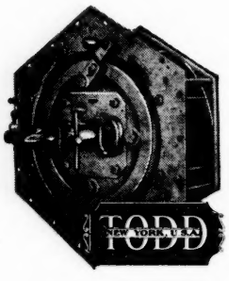

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cordance with the ASA A42.1-46 "Standard Specifications for Gypsum Plastering, including Lathing and Furring Requirements."

While this might not be in as much detail as many would like, it is felt that they represent recommendations of people concerned not with the mechanical or heating principles involved but with a quality material. If these few simple recommendations are followed with any of the systems, it is felt the gypsum products will perform satisfactorily.

Very truly yours,

Chester E. Abbey
Research Engineer

Gypsum Association
Chicago, Ill.

High Temperature Hot Water

EDITOR, HEATING AND VENTILATING:

Referring to C. P. Stolberg's article in your March issue on "Heating Today's Industrial Plant," I would like to see this article extended. I am firmly convinced that the steam age is, or should be, a thing of the past, and I would like to see this point debated.

There is no heat transfer problem, as far as I can see, that cannot be solved by hot water at temperatures to suit the particular problem, in an economical and exacting manner, with high temperature hot water, pump accelerated, since it is so easily controlled over a wide range to suit any commercial problem.

Eliminating steam cuts out all accessories such as steam traps, reducing valves, etc., which are always a source of annoyance some time or the other to the maintenance engineers.

With high temperature hot water the maintenance is reduced to a minimum, and in these days of factory economies it must weigh heavily in its favor.

E. J. Bearfoot,
Managing Director
Bearfoot & Bryett, Ltd.

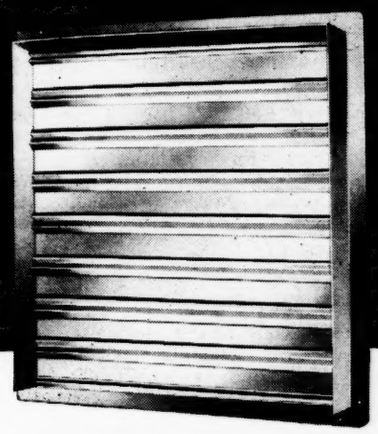
Dartmouth Hill, London.

Getting Personal

S. Konzo—whose photo we were unable to obtain. (*Air Requirements for Summer Cooling as Affected by Heat Gain in Ducts*, page 85) was born in 1905 in Tacoma, Washington, and was educated in elementary schools there, following which he graduated *cum laude* from the University of Washington in 1927 with a bachelor's degree in mechanical engineering. Upon graduation, he received a research fellowship at the Engineering Experiment Station of the University of Illinois, and there studied under Professors Willard and Kratz.

Assigned initially to a project dealing with metal cutting, he later was assigned to steam and hot water heating research. In 1929 he was appointed special research assistant under Professor Kratz to conduct warm air heating research as part of the warm air research cooperative program sponsored by the National Warm Air Heating and Air Conditioning Association, and in 1940 he was made a special research professor in connection with this work.

they all want AIR-FLO



MODEL A-555

THE AUTOMATIC SHUTTER WITH ALL THE FEATURES

Front View—Closed

IT TAKES THE LOAD OFF THE FAN!

Aluminum louvers open fully, permitting capacity fan operation. New heavy reinforcement strip adds strength and long life to the louvers, assures quiet operation and perfect counterbalance, prevents rattling. Deep shroud protects shutter from high winds. Tie-rod, brackets and bearings inside frame, not exposed to weather. Special finish resists corrosion. Many other features.

Write for New Air-Flo Catalog 43-F

Illustrations and details of the complete Air-Flo line.

AIR CONDITIONING PRODUCTS CO.
2340 W. LAFAYETTE BLVD. • DETROIT 16, MICH.

ANGLE RINGS

to Specification

You'll save time and effort by getting the ring that can be fitted on the job easily.

We roll angles, tees, channels, bars and special shapes to fit your individual needs —with or without rivet or bolt holes.

Angle Rings are used for many purposes such as reinforcing tanks, joining pipe or smoke stacks, and installing air conditioning fans. Write for our list of standard sizes and discounts—also our circular describing our complete fabricating services.

Write today!

NATIONAL METAL FABRICATORS
2138 So. Sawyer Ave. Chicago 23, Ill.

KRITZER

NEW! RADIANT BASEBOARD

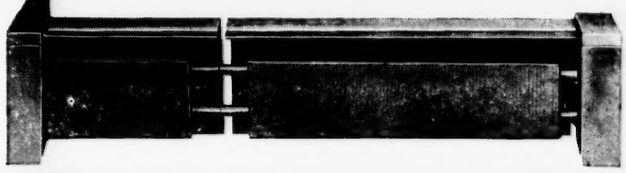
with simplified installation—

ONLY THREE EASY STEPS

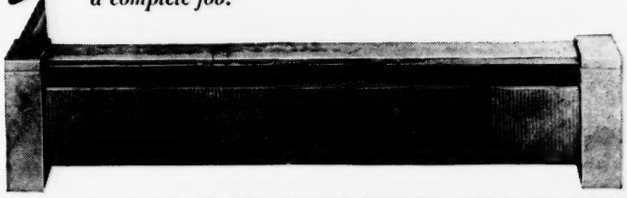
for a complete job!

1 Simply place steel back-plate on the finished floor level and nail or screw to wall. Felt sealing strips compensate for uneven walls. Delivered in 10-foot lengths for quick, easy handling.

2 Back-plates secured, now snap in coil, (screw driver is only tool needed). Solder ends of copper supply. KRITZER Radiant Baseboards can be rapidly and simply cut down "on-the-spot" from the 10-foot lengths, to fit any size room.



3 Attach filler plates where required and job is complete. NOTE: for additional decoration, Grilles, also furnished in 10-foot lengths, can be added. *They are not needed for a complete job.*



CAN YOU THINK OF ANY EASIER WAY TO GET YOUR B.T.U.'s?

A KRITZER Radiant Baseboard is a permanent installation that requires nothing more—no call-backs—no extras.

Start today to make heating jobs easier the KRITZER way.

USE THE COUPON BELOW FOR COMPLETE DETAILS—DON'T WAIT.

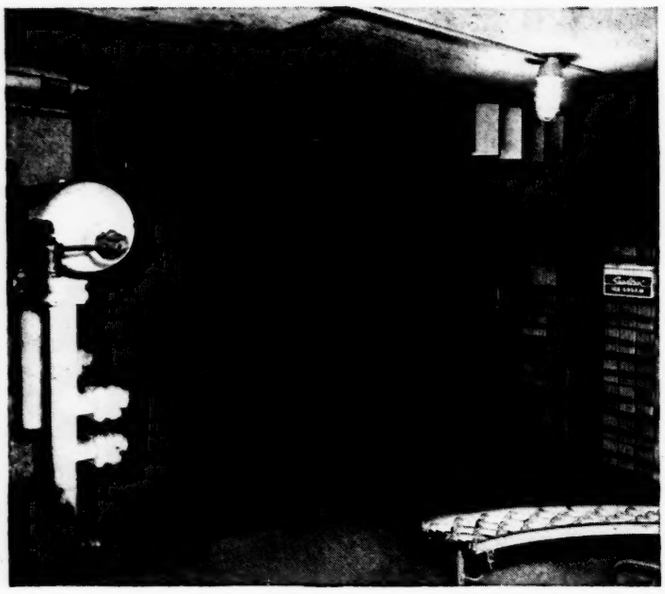
KRITZER RADIANT COILS, INC.
2907 Lawrence Avenue, Chicago 25, Illinois

Gentlemen: I'm interested. Send at once, booklet on estimating jobs with KRITZER Radiant Baseboards.

Name.....

Address.....

City.....Zone.....State.....



Do you want
COST - REDUCING
Refrigeration?

The Niagara "No Frost" Method saves you from any loss, delay, shut-down, or diminished efficiency from frost on your refrigerating coils, at any time. You always get the full capacity that you paid for when you bought your refrigerating plant.

See how this means money savings. You run with higher suction pressures and lower head pressures, saving power. Your wear and tear and maintenance is lower; you save the loss of production and the labor used in defrosting periods. You save the power that is wasted when refrigeration is supplied through coils that are frost-coated.

The Niagara "No Frost Method" is not just a means of defrosting. It is a means of operating refrigeration without the formation of frost at any time, reducing costs, quickly paying for itself.

There are hundreds of successful "No Frost" users who say it is saving money, increasing production and improving quality for them every day . . . in every type of refrigeration installation requiring temperatures below freezing . . . in food freezing, ice cream, cold storage and in special industrial applications.

Write for Niagara Bulletin No. 105
for further information

NIAGARA BLOWER COMPANY
Over 35 Years of Service in Industrial Air Engineering
Dept. HV, 405 Lexington Ave., New York 17, N. Y.
District Engineers in Principal Cities

INDUSTRIAL COOLING HEATING • DRYING
NIAGARA
HUMIDIFYING • AIR ENGINEERING EQUIPMENT

In 1947, Professor Konzo turned over active work in warm air heating research to a colleague, was appointed professor of mechanical engineering, and at present is teaching graduate courses in heating and air conditioning. In addition, he serves in an advisory capacity on four co-operative research projects now in progress in the department. He also serves as a fuel consultant for the Illinois Geological Survey.

Professor Konzo is one of the best known speakers and writers in the field of heating and ventilating, as he has been the author of an exceptionally large number of papers, bulletins and articles as well as the author of the book "Winter Air Conditioning." He is a member of the American Society of Heating and Ventilating Engineers and of the honorary fraternities Tau Beta Pi, Sigma Xi, and Pi Tau Sigma. He reports that after some 19 years of research work, he finds the challenge of teaching most stimulating and almost as much fun as trying to raise good flowers.

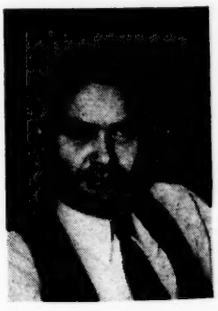
Married 17 years, Professor Konzo is the father of two young daughters. During the time left over from his duties at the University he engages in handball, tennis, collecting etchings and lithographs, and flower gardening, and from 10 p.m. to midnight reads everything he can get his hands on, with particular interest in biographies, mystery stories, travel books, and books on applied psychology.

W. Ender

Wyman Ender *(Air Requirements for Summer Cooling as Affected by Heat Gain in Ducts*, page 85) was born in Chicago in 1904 where he attended elementary and high schools. Following one-half year at the Armour College of Engineering he became associated with a testing laboratory of the Department of Agriculture and continued his education in the evening.

He enlisted in the Army Air Corps in January, 1943, where he became a B-24 pilot, was stationed in England for six months, and flew 22 missions over Germany and axis-occupied territory. Following separation from the Army in October, 1945, he enrolled at the University of Illinois. Here Mr. Ender received his B.S. in M.E. in 1948, and his M.S. in M.E. in 1949.

At present he is employed as an air conditioning design engineer for Douglas Aircraft Company, Incorporated, at El Segundo, California.



M. J. Williams

M. J. Williams *(Selection and Location of Unit Heaters in Factory Buildings*, page 77) joined the engineering department of The Trane Company in 1937. In addition to his regular engineering work, he managed the Trane graduate engineer student class program from 1938 through 1947.

Mr. Williams, 47, was born in Sedalia, Mo., and attended junior college in Kansas City. At 21, he started working in the office of Kansas City consulting engineer, Walter E. Gilham, where he was employed in engineering work for 10 years. In 1933 he joined the Corps of Engineers, Missouri River Division, in charge of designing the mechanical equipment for town site buildings at the Ft. Peck dam site. In 1934 he was transferred to Ft. Peck as mechanical inspector of town site buildings and later dredge engineer.

Two years prior to his coming to Trane, he was assistant mechanical engineer for the State of Missouri on a $10 million penal and eleemosynary project for the state.

. . . Since the Last Issue

Peabody Engineering Corp. announces the appointment of **A. P. Olches** as chief engineer. A graduate of Stevens Institute of Technology, he entered the employ of Peabody Engineering in 1928 as sales engineer and rapidly advanced to sales manager, then to manager of research and development.

The Marley Co., Inc., manufacturer of water cooling towers, nozzles and dry surface coolers, has started production in a new plant at Louisville, Ky. G. W. Zimmerman is plant manager. The Louisville plant will primarily fabricate metal for Marley products, but will also assemble some of the smaller units. The company operates two other plants—at Kansas City, Kans., and Stockton, Calif. General offices are located in Kansas City.

David F. Brittle has been appointed advertising manager, **Coal Heating Service Division** of the **National Coal Association.** Mr. Brittle is a native of Pittsburgh, Pa , and for the past several years has been a resident of Asheville, N. C., where he was advertising and sales manager for The Denison Manufacturing Co. He succeeds James E. Baker, who has resigned after serving C.H S. since December, 1946.

Russell C. Westover, Jr., became president of the **Ray Oil Burner Co.** of San Francisco, effective May 16. He succeeds Mrs. R. C. Ray, who is retiring from the active management although remaining as a director of the company. Mrs. Ray assumed personal management of the company upon the death in 1946 of her husband, the late Milton S. Ray, son of W. S. Ray, who founded the company in 1872. Mr. Westover has long been identified with the Ray Company as a director and business adviser.

Roy C. Yantis joins **Acme Industries, Inc.** as a regional sales director. Mr. Yantis was formerly sales manager for the Henry Valve Co. of Chicago. He is an Ohio State University alumnus and was formerly with Gibson Refrigeration and Frigidaire. **Charles King Carter** has joined Acme as sa'es engineer. Mr. Carter came to Acme from Universal Cooler. He was previously with Minneapolis-Honeywell and Westinghouse. **Robert T. Jones** has been appointed manager of design and development for Acme Industries. He was formerly with Chrysler Corp., Airtemp Division, for over four years as supervisor of design and development. He has also been associated with York Corp.

The **L. J. Krause Co.,** 200 Lumber Exchange, Minneapolis, Minn., has been appointed to represent **Penn Electric Switch Co.,** Goshen, Ind., in the Minneapolis district. The territory covered will include Minnesota, North and South Dakota and western Wisconsin.

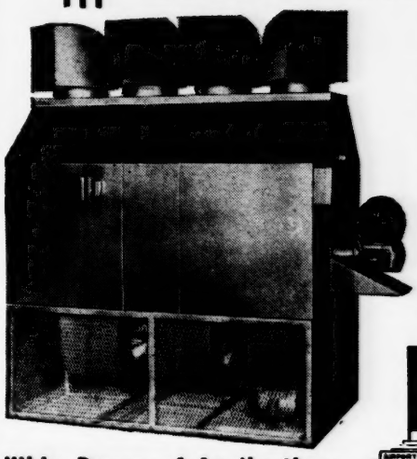
Appointment of **H. W. Milner** as sales manager of all gas-burning domestic heating equipment produced by the South Wind division of **Stewart-Warner Corp.** has been announced. Mr. Milner joined Stewart-Warner in 1948 when physical assets of Heating Research Corp., Anderson, Ind., manufacturers of Saf-Aire heaters, were purchased by Stewart-Warner. He was vice president in charge of sales for Heating Research.

Agreement for the purchase of the Gemco Air Conditioner Division of **General Engineering and Manufacturing Co.** by **Automatic Firing Corp.** has been announced. Both are St. Louis companies. Automatic Firing Corp. is a manufacturer of gas and oil conversion burners, coal stokers and other heating equipment. The purchase was arranged to provide a year-round sa'es and manufacturing operation. Gemco air conditioning distributors throughout the country will be given the opportunity to sell Automatic Firing heating equipment, it is said. The purchase does not include the machine tool division of Gemco, which General Engineering and Manufacturing Co. will continue to operate.

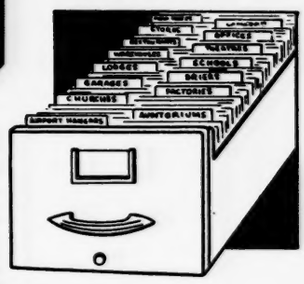
NATIONAL CHAMPION

GAS and OIL BURNING DIRECT FIRED UNIT

HEAVY DUTY FORCED AIR UNITS FOR LARGE SPACE HEATING REQUIREMENTS



A self-contained unit with adjustable discharge heads for positive heat delivery in any direction. Streamlined fire box of high heat and corrosion resisting Type 310 Stainless Steel insures a far longer life of service and satisfaction. Tear Drop combustion chamber design and convector tube arrangement affords complete efficient air wipage of all heating surface at minimum resistance. Available in models for central heating systems employing supply and return ducts.



Wide Range of Applications

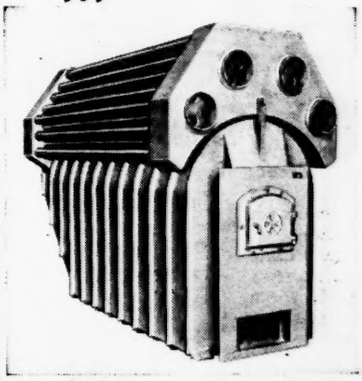
These units have proven practical and economical for most types of public, commercial and industrial buildings. National Champion heaters are the product of over a half century of experience in this field and the latest advanced engineering features of these units have been tested in a rapidly increasing range of actual installations.

GENERAL CAPACITY DATA

Model Number	Btu	Cfm	hp.	Dimensions (inches) length-width-height			Approximate Shipping Wt., Lbs.
T.D.— 25	250,000	3,600	¾	60	32	81	1,300
T.D.— 40	400,000	5,400	1	60	32	81	1,350
T.D.— 50	500,000	6,600	1½	80	32	81	1,780
T.D.— 70	750,000	8,800	2	80	32	81	1,855
T.D.— 80	800,000	10,200	3	80	48	81	2,110
T.D.—100	1,000,000	12,500	5	80	48	81	2,200
T.D.—125	1,250,000	15,300	5	100	54	103	3,000
T.D.—150	1,500,000	19,400	7½	100	54	103	3,250

NATIONAL HEATER

COAL FIRED FORCED AIR UNIT

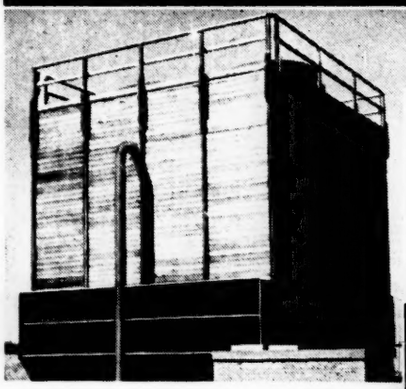


Specifically constructed and designed for stoker and hand firing with blower position at rear of casing, this unit embodies all the features of other NATIONAL heaters for greater satisfaction and economy of operation. Can be quickly and efficiently converted to light oil, heavy oil or gas firing as future fuel costs and supplies may necessitate.

• *Write for Literature*

NATIONAL HEATER CO.
CLEORA & VANDALIA STREETS
ST. PAUL 4, MINNESOTA

Pritchard COOLING TOWERS



Thoroughly Engineered*

...Adequately Sized

THREE LEADING LINES
Cooling Towers
Heat Exchangers
Gas Equipment for
FIVE MAJOR FIELDS
Chemical, Natural Gas, Petroleum, Power and Refrigeration.

J.F. P Co.

*For Longer Life and Trouble-Free Performance

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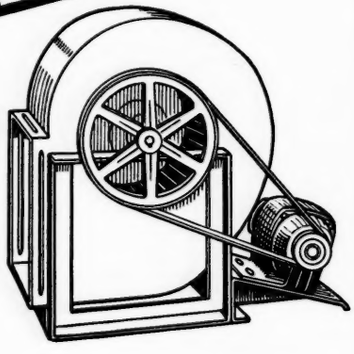
908 Grand Ave., Kansas City 6, Mo.

Representatives in Principal Cities

J.F. Pritchard & Co.
ENGINEERS • CONSTRUCTORS • MANUFACTURERS
for the CHEMICAL, PETROLEUM, GAS & POWER industries

HY-DUTY BLOWERS



● There's a Hy-Duty properly sized for hundreds of jobs where large volume, low velocity and quiet are demanded—double inlet or single—top or bottom motor mounting—all discharge positions—200 c.f.m. to 15,000—heavily constructed—looks and finish to stack up with the best jobs and priced right.

Announcing . . .

A new, high powered, quiet, direct driven, single inlet Hy-Duty blower with a wheel 5" diameter, 3" wide. Immediate delivery, attractive price, suitable for a multitude of small air handling jobs.

AIR HANDLING AT ITS QUIETEST BEST

● SEND FOR LITERATURE AND ENGINEERING INFORMATION

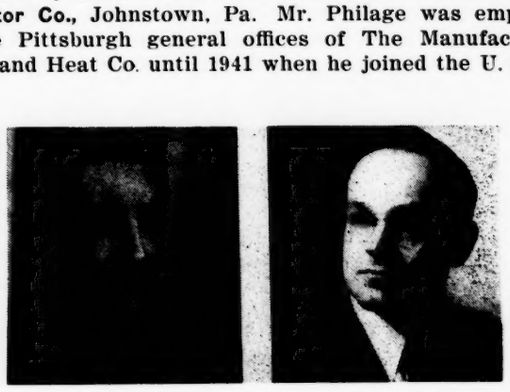
BLOWERS • ATTIC FANS • EXHAUST • PORTABLE OR WINDOW FANS

SCHWITZER-CUMMINS COMPANY
VENTILATING DIVISION • INDIANAPOLIS 7, INDIANA
Fine Blowers and Fans for over 30 Years

M. V. Osterhout, manager of the Milwaukee branch house of the **American Radiator & Standard Sanitary Corp.,** has been appointed supervisor of the South Central division. The South Central division has been newly created. Its headquarters wi'l be in Cincinnati. Mr. Osterhout has been associated with American-Standard and its predecessor companies since 1920.

Assignment of Kaylo insulation sales engineer **Arthur B. Pike** to the New England territory has been announced by **American Structural Products Co.,** a subsidiary of Owens-Illinois Glass Company. Mr. Pike assumed his new duties in May, with headquarters at 1227 Statler Office Building, 20 Providence St., Boston 16, Mass.

Charles J. Philage is now acting manager of the advertising department and **Edward J. Sakal** is acting manager of accessory sales in the heating division of **The National Radiator Co.,** Johnstown, Pa. Mr. Philage was employed in the Pittsburgh general offices of The Manufacturers Light and Heat Co. until 1941 when he joined the U. S. Air



C. J. Philage *E. J. Sakal*

Force. Upon return to civilian life in 1945 he joined National Radiator. He has been handling advertising and sales promotional duties since that time. Mr. Sakal joined the company's purchasing department in 1939. He transferred to the heating division sales department in 1946.

The **International Boiler Works Co.,** East Stroudsburg, Pa., has elected **J. B. Kingsley** vice president and general manager. Mr. Kingsley has been with IBW since 1928 and previously was vice president and general sales manager for this company. Prior to joining IBW, Mr. Kingsley was associated in an engineering capacity with both the Socony Burner Corp., and the American Car and Foundry Co. He is a graduate of the New York University School of Applied Science.

H. N. McMenimen, Jr., has been appointed manager of distribution sales of the **General Electric Co.'s** Air Conditioning Department. Formerly a vice president and general manager of a division of the Reynolds Metals Co., Mr. McMenimen joined General Electric in February of this year. From 1924 to 1937 he held the position of purchasing agent and other managerial posts in Carrier Corp.

Appointment of **M. L. Judd** as manager of the warm air furnace division, **United States Radiator Corp.,** has been announced. Mr. Judd was formerly sales manager of General Motors' Delco Appliance Division, Rochester, N. Y. He was with that Division since 1931, and specialized in the sale of various kinds of automatic heating equipment. He graduated from Allegheny College, Meadville, Pa., and later from the Harvard Graduate School of Business Administration.

Retirement of **A. N. Martin,** vice president of the **Pyle-National Co.,** has been announced. Mr. Martin, who has been associated with the company for 31 years, was first employed as purchasing agent in 1918. In 1927 he was elected a vice president and placed in charge of the New York office and has remained there in that capacity ever since.

Three new directors and two new vice presidents have been named by **Dravo Corp., Pittsburgh.** The new directors are **Gordon W. Cameron,** treasurer of the Aluminum Company of America; **Louis A. Mertz,** vice president and treasurer of Dravo, and **Howard H. Sturdy,** general manager of Dravo's contracting division. The vice presidents are **Mr. Sturdy** and **Byron E. Rhoads,** chief engineer of Dravo's contracting division.

Alex K. Tinker has been named manager of the New York York branch sales office of **The National Radiator Co.,** Johnstown, Pa., and **Fred S. Hudson** succeeds him as Pittsburgh branch manager.

Harry J. Wines of New York City has been named sales manager of the automatic heating division of the **General Electric Co.'s** Air Conditioning Department. In his new capacity Mr. Wines will be responsible for all departmental sales of heating equipment. Mr. Wines was formerly vice president in the sales division of the Zenith Radio Corp., and for 16 years was sales manager with Frigidaire and Delco Division of General Motors Corp. in New York. He joined General Electric in April of this year.

Appointment of **L. T. Carson** as manager of the water heater division of **United States Radiator Corp.** has been announced. Mr. Carson was formerly midwest sales manager at Des Moines, Iowa, for the Jud Whitehead Co., Oakland, Calif., manufacturers of water heaters.

Gustav Egloff, petroleum technologist and director of research for the Universal Oil Products Co., Chicago, has been elected to the presidency of the **Western Society of Engineers.**

Elevation of two Fiberglas executives to corporate vice presidential posts and appointment of a third as a divisional vice president were announced by **Owens-Corning Fiberglas Corp. L. R. Kessler** was named vice president of the corporation and general manager of the Pacific Coast Division, with headquarters at Santa Clara, California, where a new Fiberglas plant, now under construction, is scheduled to start production in July. **Ben S. Wright** was appointed vice president of the corporation and general sales manager, with headquarters in the Fiberglas general offices in Toledo. **W. C. Winterhalter** was named vice president and sales manager of the Pacific

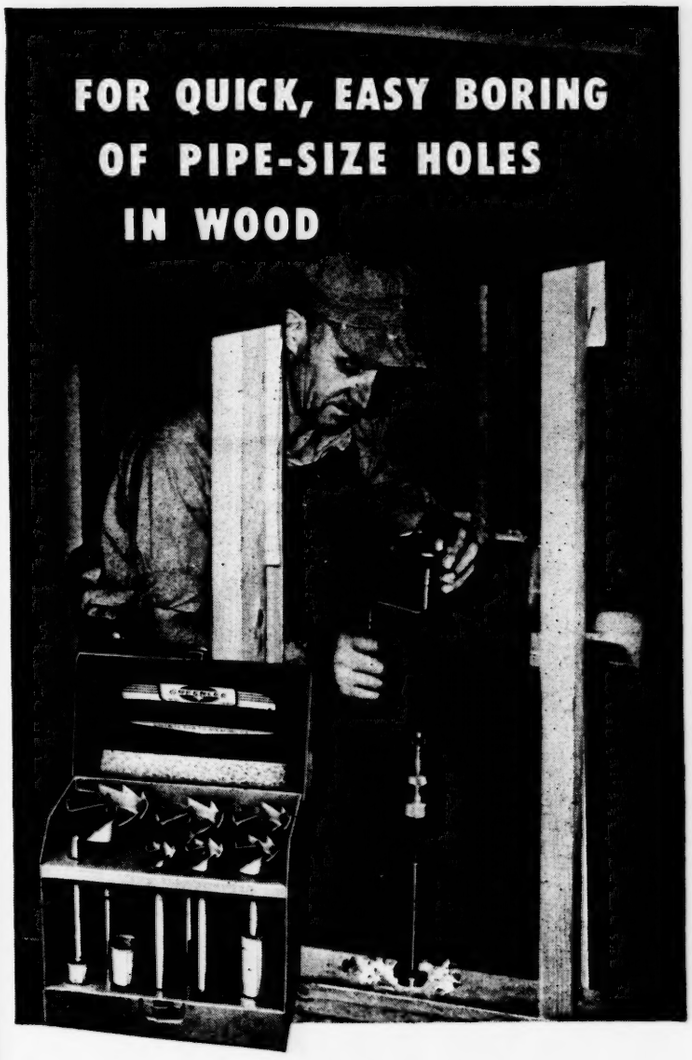
L. R. Kessler

B. S. Wright

W. C. Winterhalter

Coast Division, located in Los Angeles. Mr. Kessler was with Owens-Illinois Glass Co. from 1932 to 1946. He joined the Fiberglas Corp. three years ago and was placed in charge of preliminary development work on the West Coast. Mr. Wright became associated with Owens-Corning in 1940 and was assigned to the general office sales organization as manager of the Fiberglas Yarns Division. Mr. Winterhalter joined Owens-Corning Fiberglas Corporation when it was formed in 1938, transferring from the Industrial Materials Division of Owens-Illinois Glass Co. He has been manager of the Fiberglas branch sales offices in the western states since that time.

Robert C. Seaton has been named manager of the Richmond, Va., sales branch of **The National Radiator Co.,** Johnstown, Pa. He succeeds William E. Austin, who has retired. The sales office is located at 12 S. Third St., Richmond 19, Va.



. . . the new GREENLEE PIPE BIT SET

Designed especially for plumbers, steamfitters and electricians to provide fast, easy boring of accurate holes in wood for ½" to 2" pipe and conduit. Makes swift, easy work of an otherwise tedious, hard job! The set is furnished in a sturdy, attractive metal box with convenient carrying handle. Bits have ½" shanks for use in portable electric or pneumatic drills and in stationary boring machines. An adapter is provided for standard auger-bit braces. Adapters are also furnished for using standard ⅜" pipe as an extension for deeper boring and longer reach. Get facts today on these timesaving GREENLEE tools. Write Greenlee Tool Co., Division of Greenlee Bros. & Co., 2326 Twelfth Street, Rockford, Illinois.

TOOLS FOR CRAFTSMEN

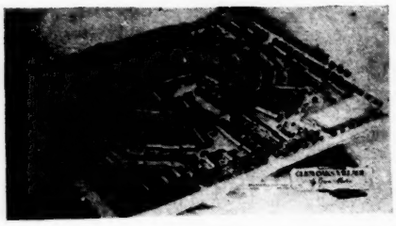
GREENLEE

ANOTHER New York City Housing Project Installs

THERM-O-TILE

Reg. U. S. Pat. Off.

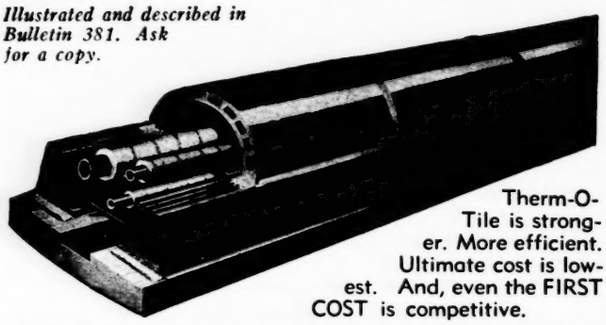
Underground Steam Conduit



TODT HILL HOUSES

The architect's "airplane view" of the first section at GLEN OAKS VILLAGE is shown at the left—the largest of its type in the USA. See our ad. in the January issue of Heating, Piping and Air Conditioning.

Illustrated and described in Bulletin 381. Ask for a copy.



Therm-O-Tile is stronger. More efficient. Ultimate cost is lowest. And, even the FIRST COST is competitive.

Sold and installed by Johns-Manville Construction Units in all Principal Cities.

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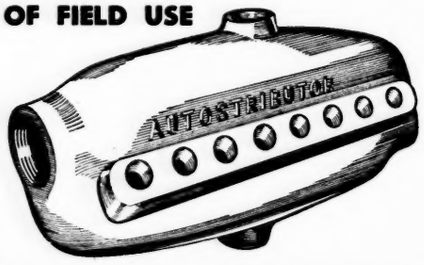
2 YEARS OF FIELD USE



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- **Time and materials saved mean more profits and lower bids on any type of job.**
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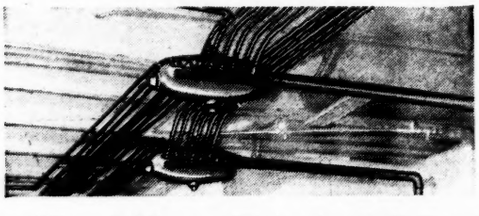

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THE AUTOSTRIBUTOR COMPANY

238 MILL STREET LANSING, MICHIGAN

Five new vice presidents and a new treasurer have been notified of their appointments by **Frank C. Campbell**, president of **Redmond Company, Inc. James Tweedy**, new vice president in charge of induction motor sales was formerly with Chrysler and General Motors and has been with the Redmond sales organization since 1943. **Paul B. Best, Jr.**, was made vice president in charge of series motor sales. He has been with the company since 1939. **James G. Kennedy**, promoted to vice president in charge of production in Owosso has been with Redmond since 1944. **Paul Maurer** has been named vice president in charge of engineering, being advanced from director of engineering. He became executive engineer of the Redmond Company in 1943. **Wilfred R. Fox**, formerly with Buick Motor Division of General Motors, joined Redmond as advertising manager in 1944. For two years he served concurrently as advertising manager of National Pneumatic Company in Rahway, New Jersey. In addition to his appointment to vice president of Redmond Company, Inc., he was recently named manager of advertising and marketing research for Holtzer-Cabot, Inc., an affiliated manufacturer of electric motors and telephone equipment in Boston, Massachusetts. **W. Walter Young** is now comptroller-treasurer, having previously held the position of comptroller.

John B. Hewett, who for ten years was sales manager of Anemostat Corp. of America, has acquired the **William W. Short Co., Inc.**, 274 Madison Ave., New York City, which was organized and formerly operated by the late Mr. Short The company will continue to represent the following accounts in the greater metropolitan district of New York, Westchester County, Long Island and Northern New Jersey: Anemostat air diffusers, Titus registers and grilles, Drayer-Hanson coils and condensers, Chicago fans and blowers, Raytheon electrostatic precipitators, and Young Regulator controls.

K. B. Thorndike, vice president of Detroit Lubricator Co., Chicago, Illinois, was elected president of the **Refrigeration Equipment Manufacturers Asscciation** at its annual board of directors meeting held in Chicago on March 30.

The National Association of Refrigeration Contractors has added a Miami local association to its membership roster. Officers of the local association—to be known as the Air Conditioning & Refrigerating Association of Florida—are: Paul E. White, president; R. Ernest Nitzsche, vice president; Harry C. Higgins, treasurer. Headquarters of the local group are at 1168 N.W. 41st St., Miami 37, Florida, with Howard S. Davis, executive secretary, in charge.

Stanley H. Hobson, of Rockford, Ill., was elected president of the **Gas Appliance Manufacturers Association** at the 14th annual meeting. Mr. Hobson, who is president of the **George D. Roper Corp.** will take office in October.

Lionel Jacobs, who for almost ten years has been president and majority stockholder of **Automatic Heat Inc.** of Philadelphia, became chairman of the board of that company as of April 1. **J. A. MacDougall**, formerly manager and assistant treasurer, becomes president and treasurer with full charge of operations. He was connected with the organization in Philadelphia for a number of years prior to the branch being sold by Timken Silent Automatic Division to Jacobs and his associates.

The Auer Register Co., Cleveland, manufacturers of registers and grilles, has appointed **L. J. Krause Co.**, 200 Lumber Exchange, Minneapolis 1, Minn., as a factory representative and distributor. They will execute sales representative work in Minnesota, Iowa, North and South Dakota, Nebraska and western Wisconsin. Mr. Krause was previously with the Minneapolis-Honeywell Regulator Co. in various capacities.

Robert E. Daly has been named northwestern district sales representative of **The National Radiator Co.**, Johnstown, Pa. Mr. Daly has established offices at 3355 East 182nd Street, Seattle 55, Wash.

Lew **E. Wallace** became general manager of sales, and **Jay W. Owings** became an assistant general manager of sales in promotions announced by **The Youngstown Sheet and Tube Co.** For the last 16 years Mr. Wallace has been manager of the company's New York sales office. In his new position he will have two assistants, Myron H. Watkins, who has been assistant general manager of sales nearly two years, and Mr. Owings, who, for the last two years, has been manager of oil country tubular sales. Mr. Wallace fills the sales department vacancy created by the death of Charles H. Longfield, March 6. Mr. Wallace joined The Youngstown Sheet and Tube Co. as an inspector in the Campbell plant in 1915. **John P. Feagley** has been appointed district sales manager in charge of the New York office of The Youngstown Sheet and Tube Co., succeeding Mr. Wallace. Mr. Feagley has spent 17 years with the company, all of them in the New York office. **Philip G. Boyd** has been appointed Chicago district sales manager for Youngstown, succeeding Arthur Purnell, who died April 1.

Appointment of **R. G. Kollar** as manager of the Radiant Baseboard Division of **United States Radiator Corp.** has been announced. Mr. Kollar formerly represented Trundle Engineering Co., management engineers in the Michigan area. He studied engineering at the University of Michigan and Ohio State University. He will be in complete charge of sales, production, and engineering of U. S. Radiant Baseboard.

Johnson Service Co. of Milwaukee, manufacturers, engineers and contractors of automatic temperature and air conditioning control systems, has announced the appointment of **Joe Wheeler, Jr.,** as manager of their New York branch. Mr. Wheeler, a native of Fort Dodge, Iowa, has been with the Johnson Service Company since 1931 and came to the New York office in 1935, after serving in the company's Chicago, Cleveland and Boston branches as sales engineer.

Cochrane Corp., Philadelphia, announces the acquisition of substantial'y all of the capital stock of **Liquid Conditioning Corp.,** Linden, N. J., which will operate as a wholly owned subsidiary of Cochrane. Liquid Conditioning products, comprising a line of equipment for the conditioning of water and other liquids, marketed under the trade name "Liquon," will continue to be sold under that name.

The addition of two New England branch offices has been announced by **Johnson Service Co.,** Milwaukee, manufacturers, engineers and contractors of automatic temperature and air conditioning control systems. The new Hartford, Connecticut, branch, under the management of **E. J. Hoaglund,** will serve most of Connecticut and Vermont and in western Massachusetts. The Portland, Maine, branch, which will be headed by **E. C. Doyle,** will handle Johnson installations throughout the state of Maine. Both Mr. Hoaglund and Mr. Doyle were formerly sales engineers in the company's Boston office.

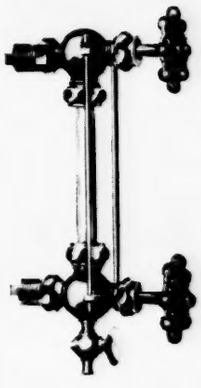
Air Reduction Co., manufacturers of industrial gases and welding equipment, has announced the opening of a new oxygen plant in Flint, Michigan. The plant, built at a cost in excess of $250,000, will produce more than four million cubic feet of oxygen per month. The plant will also be an acetylene gas supply point and a storeroom for welding equipment and supplies.

W. Raymond Mook, Jr., has been appointed to the engineering staff of the **Thatcher Furnace Co.** Mr. Mook, a graduate of Stevens Institute of Technology, class of 1927, served with the Petroleum Administration for War, as chief of District No. 3 in Texas. Just prior to joining Thatcher, he was manager of the Roosevelt Oil Service Corporation.

FOR BETTER WATER GAUGES

USE Roberts

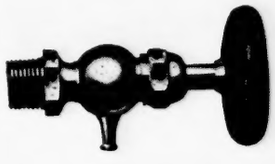
- SOLID BRASS
- SELF-CLEANING
- FOR WORKING PRESSURES Up To 175 POUNDS



For decades Roberts Water Gauges have been a standard of quality wherever tubular glass gauges are used.

Modern design—made of solid brass with plenty of strength. Self-cleaning feature keeps lower part of gauge from clogging with scale. Special packing allows free expansion of glass, avoiding breakage.

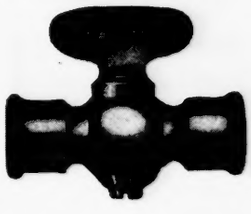
COMPRESSION GAUGE COCKS



Solid brass, durable, with seats that stand long use. Model shown has stuffing box.

Also offered in light pattern less stuffing box.

AIR COCKS—STEAM GAUGE COCKS



Roberts makes air cocks of all types and steam gauge cocks for pressure gauges.

All sizes – 1/8" up to 1/2".

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MODERN, COMPACT
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The T-70 can be used either with the famed GENERAL CONTROLS B-60 All-Gas" or the T-30 low voltage control systems, or any other standard low voltage control circuit.

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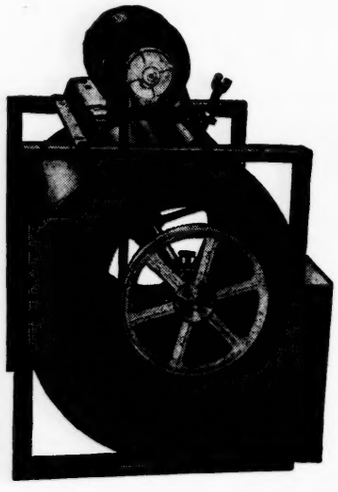
DISTRIBUTORS IN PRINCIPAL CITIES



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MASSACHUSETTS . .

By changing the position of the oil cup, the four popular discharges (lower horizontal, upper horizontal, down-blast and up-blast) can be obtained. Sizes 7 to 16½ inches wheel diameter.

WRITE FOR BULLETIN No. 110 CATALOG

MASSACHUSETTS BLOWER DIVISION
The BISHOP & BABCOCK Mfg. Co.
4901 HAMILTON AVENUE · CLEVELAND 14, OHIO

L. E. Thompson has been appointed manager of product service and renewal parts sales of the **General Electric Co.'s Air Conditioning Department.** Mr. Thompson will continue his activities as manager of renewal parts and, in addition, will take over responsibilities for the activity of the headquarters field engineering group.

Robert A. Hoagland, for the past eight years vice president and sales manager of Jefferson Electric Company, Bellwood, Illinois, has been appointed vice president and general sales manager by **Mills Industries, Inc.,** Chicago, manufacturers of beverage coolers and dispensers, automatic fountains, compressor and condensing units, and ice cream machines.

The directors of the **C. A. Dunham Co.** voted April 28 to declare a dividend of seven cents a share on the Class A and Class B common stock of the company, payable May 15 to stockholders of record May 1. This is the second payment on the stock this year, a like dividend having been declared in February. At the annual stockholders meeting on the same date, incumbent directors were reelected, and the board was increased from five to seven, the new members being **L. D. Mandell,** and **Lewis C. Murtaugh,** respectively vice president and secretary of the C. A. Dunham Co. The directors reelected the officers of the company.

C. A. Dunham Co., Chicago, with manufacturing plants at Marshalltown, Iowa; Michigan City, Indiana; Toronto, Canada and London, England, moved its general offices on May 2nd from Chicago to its new one-story addition to the Michigan City plant. Part of the new building will be used for the storage of finished products and the balance will house the order and billing departments formerly in Chicago. The administrative offices remain in Chicago.

Howard Lavaty has been appointed sales representative for the **Marsh Heating Co. Division** of **Jas. P. Marsh Corp.** and is handling a complete line of heating specialties in the metropolitan Chicago area. The name of his company is the Lavaty Engineering Co., with office located at 205 West Wacker Drive, Chicago.

The Lincoln Electric Co. has announced the election of three additional members to its board of directors. The new directors are **G. F. Clipsham,** assistant to the president, **William Irrgang,** director of plant engineering, and **L. K. Stringham,** director of welding development. The election of these board members raises the total on the board of Lincoln to thirteen.

Combustion Control Corp., manufacturers of Fireye combustion safeguards, has announced the appointment of **Laurance D. Sibley** as general sales manager in charge of all district and factory offices. Mr. Sibley has been associated with the company in various executive capacities since January 1, 1945. Prior to joining the Combustion Control Corporation Mr. Sibley served as Chief Engineer of the Marine Division of the Bendix Aviation Corporation. He is a graduate of Massachusetts Institute of Technology.

The Illinois Engineering Co., Chicago, manufacturers of steam heating systems and automatic steam and fluid control equipment since 1900, announces the appointment of **Russell R. Gannon Co.,** 700 Dixie Terminal Building, Cincinnati 2, Ohio, as its representative in Cincinnati and Louisville. Their territory includes southwestern Ohio and all of Kentucky.

The appointment of **Robert G. Harrison** as sales representative for the northern Ohio area has been announced by **The National Radiator Co.,** Johnstown, Pa. Mr. Harrison will maintain headquarters in Cleveland.

Cutler-Hammer, Inc., Milwaukee, recently announced the appointment of **J. C. Atkins** to the post of heating industry specialist. Mr. Atkins' duties would involve surveying the over-all requirements of the field and making recommendations on the basis of those requirements.

INDUSTRIAL DEGREE-DAYS
April, 1949

City	55F Base	45F Base
Baltimore, Md.	80	3
Buffalo, N. Y.	302	90
Chicago, Ill.	237	61
Cleveland, Ohio	256	70
Detroit, Mich.	266	73
Indianapolis, Ind.	191	36
New York, N. Y.	114	2
Philadelphia, Pa.	100	4
Pittsburgh, Pa.	183	28
St. Louis, Mo.	114	21

Canadian Degree-Days for April, 1949*

City	April		Cumulative, Sept. 1 to Apr. 30	
	1949	Normal	1948-49	Normal
Calgary, Alta.	582	750	8983	8631
Charlottetown, P.E.I.	795	858	7179	7727
Crescent Valley, B. C.	534	624	7818	7328
Edmonton, Alta.	528	780	9641	9369
Fort William, Ont.	735	888	8998	9478
Grande Prairie, Alta.	681	822	10435	9617
Halifax, N. S.	690	768	6226	6902
London, Ont.	669	642	6451	6968
Medicine, Hat, Alta.	438	606	8592	8194
Moncton, N. B.	753	798	7442	8094
Montreal, P. Q.	616	715	6990	8088
North Bay, Ont.	813	813	8371	8746
Ottawa, Ont.	669	726	7390	8364
Penticton, B. C.	441	507	6923	6073
Porquis Junction, Ont.	918	972	9554	10586
Prince George, B. C.	693	738	9340	8506
Quebec City, P. Q.	657	849	7473	8848
Regina, Sask.	576	816	10260	10457
St. John, N. B.	684	792	6795	7576
Saskatoon, Sask.	570	725	10348	10081
Toronto, Ont.	584	669	5873	6895
Vancouver, B. C.	498	498	5596	4977
Victoria, B. C.	465	504	4953	4569
Windsor, Ont.	558	582	5681	6454
Winnipeg, Man.	669	822	9956	10444

*These data are supplied through the courtesy of the Meteorological Division, Air Service Branch, Department of Transport, Canada.
The Department reports a slight revision in the figure for March for Quebec City, P. Q., as published in last month's issue. Corrected figure is 1215.

COMING EVENTS

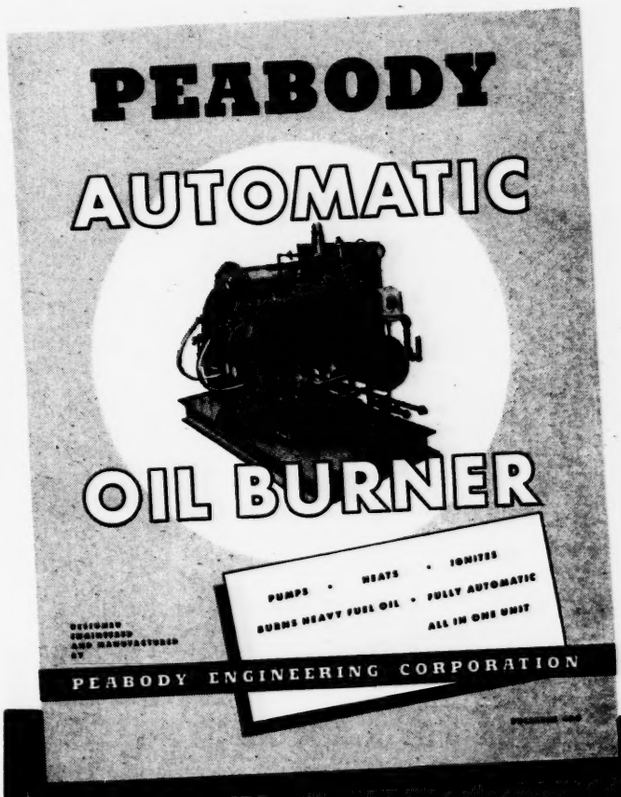
Where listed, names or titles of individuals are those from whom further information is available.

STOKER MEETING — Annual meeting, Stoker Manufacturers Association, at French Lick Springs, Ind. Headquarters not announced. Marc G. Bluth, executive secretary of Association, 307 N. Michigan Ave., Chicago 1, Ill. .....**JUNE 13-14, 1949.**

I-B-R SHORT COURSE—Third I-B-R short course on steam and hot water heating systems, sponsored by the University of Illinois and I-B-R, on the university campus at Champaign-Urbana, Ill. .....**JUNE 14-17, 1949.**

(Continued on page 136)

now available . . .



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AUTOMATIC BURNER
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